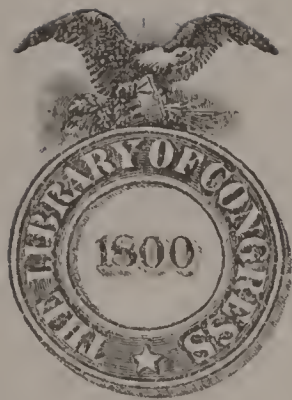


ECONOMIC PLANTS OF CALIFORNIA

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A Flora of the
Economic Plants of California
for Agricultural Students

including the important crop plants, agricultural weeds, poisonous plants, honey plants, medicinal plants, chaparral shrubs, native timber trees, and the most common native plants of the spring flowering

BY

WILLIS LINN JEPSON

Professor of Botany in the University of California

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BERKELEY, CALIFORNIA

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Issued March 26, 1924



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PREFACE

It is the purpose of this flora to describe in a systematic way, for the use of the beginner, the more important economic plants of California in connection with the more important or well-known native plants. Every agricultural student should have some training in systematic botany, combined with practise in the use of a flora. Material of the well-known native plants, which can usually be had in abundance, furnishes an excellent means for studying the distinctive structural features and special biology of the more important families. If the cultivated crop plants and other economic plants be studied at the same time, the familiar plants of both garden and field are thrown into an orderly sequence in the student's mind, because shown in relation to their nearest relatives. No course in agricultural botany should be considered satisfactory that does not include a study of the relationships of the principal natural families of seed plants, their geographic distribution and the place of the economic plants amongst them.

No attempt is made, in this book, to describe all cultivated plants, any more than all native plants. The description of all the cultivated plants in California would require perhaps thirty volumes of the present size. This book, however, includes a number more than sufficient to exercise the student in the characters of the important natural families, and to develop for him the fascination of plant relationships.

For assistance in putting the manuscript through the press the author is indebted to Joyce M. Saunders, botanical artist, and A. C. Carlson, Associate in Botany, University of California, and to his students and research assistants, Elsie M. Zeile and Herbert L. Mason. Other acknowledgements are indicated at appropriate places in the text.

WILLIS LINN JEPSON.

Berkeley, California,
Dec. 12, 1923.

THE DEVELOPMENT OF IDEAS IN CLASSIFICATION

While the Chaldeans and Egyptians cultivated science, and gave some attention to plants, the more important of ancient written records regarding botany begin with the Greeks. The earliest study of plants was of course economic; plants were looked to for their uses. Practically all the essentials of Grecian knowledge is summarized in the Enquiry into Plants by Theophrastus, who was the pupil of Plato and fellow-pupil of Aristotle. Theophrastus described not only the plants of Greece, but from trained scientific observers who accompanied the military expeditions of Alexander the Great to the Orient, he obtained accounts of such plants as the Banyan, Myrrh, Cotton Plant and Frankincense.

Plants were classified by the Greeks into Herbs, Shrubs and Trees, a crude arrangement but one which was to last a long time. Theophrastus discussed at length and in a highly interesting manner the flowers of

various plants but he had no conception of the real structure of the flower, nor, though he speaks of "male" and "female," did he apprehend sexual significance in plants. That the flower necessarily goes before the seed, he did not understand, for he says of the female date palm that it exhibits its fruit without any antecedent flower, though he sees that the male tree has a flower. In other cases as in that of the fig he reasons that since the tree has fruit and seed, it must have flowers, albeit he admits never having seen them. He indicated clearly the difference between the germination of the seed of barley or wheat and of beans and other leguminous plants, but he did not comprehend the extended classificatory significance of this observation which foreshadows the division of monocotyledons and dicotyledons. While in few cases did Theophrastus see the full significance of his determined facts, nevertheless for his day he made many profound observations: he named various gross organs; he distinguished between permanent and transient organs, between centripetal and centrifugal inflorescences; he recognized aerial roots as roots and set them off from tendrils and pointed out that all underground so-called roots are not roots—a germ of the science of morphology which was to lead after two thousand years to great consequences.

Theophrastus is often spoken of by the predatory intellectual with some emphasis as a philosopher rather than as a botanist, as if the terms were mutually exclusive, but I may be pardoned for pointing out that when a philosopher in this day wishes to know whether figs have flowers, he does not depend upon philosophic reasoning but sends a wire to me by Western Union Telegraph, collect. It is most interesting nevertheless to see that Theophrastus, two thousand years ago, knew so much that we know.

In 77 to 78 A. D., Dioscorides wrote his *Materia Medica*, in which he described 400 medicinal plants. He is the most popular botanical author that ever lived, since no other botanical book ever had such a run: it passed through numberless editions and continued to be the most valuable and most used guide to medicinal plants until the Seventeenth Century.

The Sixteenth Century was the age of the herbalists, Brunfels, Fuchs, Bach, Turner and many others. These men went direct to the fields and woods to study plants and developed to a high degree, especially in Brunfels' Herbarium, the art of plant illustration. While in most cases the illustrations were made from studies of living plants, they stand alongside descriptions copied from the ancients because it was not yet understood how great was the difference in genera and species between the plants of western and northern Europe and the plants of Greece. One of the herbalists in particular, Valerius Cordus, does wholly otherwise than to copy and shows genius, for (as Tournefort says) he was the first of all men to excel in plant description. Fuchs' *Historia Stirpium* is important in that he abandons the alphabetical arrangement which had held since the Greeks. These herbalists had, however, little success at classification, except to bring together certain plants of habitual similarity.

This practice of regarding the externals had also come down from the

ancients. Any shrub having a dark green narrow pointed leaf, thick and leathery, was referred by the Greeks to the genus *Daphne* of the Greeks, that is *Laurus* or Laurel, and included such plants as true Laurel, as Oleander, as Butcher's Broom—all belonging to widely different natural families, but all called Laurel because of their shiny entire leaves, just as so-called to this day by illiterates, a few gardeners and some vain intellectuals. Many of the genera of the herbalists were, to be sure, natural, many more were not, because they were constantly misled by analogies, a source of error persisting to the present day.

The first botanist to minimize mere external appearance, and so make a step in the right direction, was Caesalpino of Florence who was thus far ahead of his time. He distributed all known plants into fifteen classes, the distinguishing marks being based on the fruit. This was the earliest methodical arrangement of plants but was extremely faulty, because based on a single organ.

We now come to the Seventeenth Century. Of all botanists up to this period, John Ray, the Englishman, was the most enlightened and did most to advance the science of botany. In his system, which is the forerunner of the natural system, he separates flowering plants from flowerless plants and divides flowering plants into Monocotyledons and Dicotyledons, though strangely enough, subordinating these to the old division into herbs and woody plants. His orders show a keen appreciation of natural affinities amongst plants.

Tournefort, the French botanist, flourished in this century, and is often spoken of as the founder of genera. His system which rested chiefly on the form of the corollas, was displaced in the next century, the Eighteenth, by that of Linnaeus which was founded on characters derived from the stamens and pistils, and especially the number of these organs, and is commonly called the sexual system. It furnished an extraordinarily facile and usable means of arranging plants, and together with the binary principle of nomenclature laid down by its author, gave a tremendous popular impulse to the study of botany. It was, however, a purely artificial arrangement, since plants of one family may vary greatly in stamen number and pistil number. The result was that closely allied plants were often separated in different classes and unrelated plants were brought together in one class. In so far as his classes are natural they are so because the number and position of the stamens have nothing to do with the sexual function, but they do by position and number indicate affinity. Linnaeus himself recognized that his system was a temporary expedient and declared the object of botanical science to be the discovery of a natural system. The most lasting contribution of the great Swedish botanist was the binomial method of naming plants, the binomial consisting of two parts, the genus name, as *Brassica* (Mustard), and the species name, *nigra*, black, *Brassica nigra*, the binomial thus not only affording a name for a plant but also indicating its relationship. Linnaeus was a very remarkable botanist and yet the gaps in his knowledge interest us exceedingly. He did not observe and did not even reason that figs had flowers and put them into his class *Cryptogamia* or flowerless plants.

A new era in botanical science dawned with the publication in 1789 of

the *Genera Plantarum* of Antoine Laurent de Jussieu, who is justly considered the founder of the natural system. He gathered up the best results of his predecessors, especially those of Ray, Linnaeus, and his uncle, Bernard de Jussieu, and conceived a system which truly displayed natural affinities. He made it clear that previous systems had broken down because of relying exclusively on a single character. He chose the Ranunculaceae, the Buttercup Family, to illustrate his principles. By no single mark can it be distinguished from all other families, but he showed that the combination of all its characters was sufficient to set it off as a natural family and that the test for inclusion of a doubtful genus within the family was consideration of the aggregate characters of that genus. He made a farther highly important deduction that the characters of a family must not always be drawn from the same organ. He fell, however, into the age-old error that the essential characters for primary groups can be determined in advance.

The wearisome exponents of the higher criticism have objected to the honor accorded Laurent de Jussieu, saying that he had the system from his uncle, Bernard de Jussieu. This is of no especial importance. The work of no great man would be possible save for the arduous labors of those who precede him; one element of greatness lies in being able to gather up and organize scattered or unrelated results into living and forceful propositions of wide application.

The stimulus given to the study of botanical classifications by the work of Jussieu produced wonderful activity in the century immediately following. The Nineteenth Century was a century of vast and unparalleled labors in botany. Of all the great names in this century one of the most remarkable is that magnificent botanical genius, Augustin Pyramus de Candolle. He developed with clearness a comparative morphology which was of great value. It rested on his doctrine of the symmetry of plants, that is all organisms in their inner nature are regular, and departures from the original symmetry of a class are due to abortion or disappearance of parts, degeneration or reduction of parts, and adherence. The morphological basis, therefore, lies in the relative position and number of the organs, not in their physiological properties. Guided by such a morphology he traced a long series of related forms and yet he did not seize upon the idea of affinity through descent. He discovered important rules but did not apprehend their real significance.

DeCandolle projected a great work to include descriptions of all known species of flowering plants. The work is entitled *Prodromus Systematis Regni Vegetabilis*, a Forerunner to the System of the Vegetable Kingdom. *Prodromus* literally means the northeast wind which blows for eight days before the rising of the dogstar. The work was intended as a forerunner of that natural system which would sometime appear in effulgent glory. He had the cooperation of the principal botanists of his day and the work was continued after his death by his very great son, Alphonse de Candolle. The first volume was published in 1824, the last in 1873. The *Prodromus* blew for fifty years but the dogstar has not yet risen.

The DeCandollean system reached its fullest development in the *Genera*

of Plants, *Genera Plantarum*, of Bentham and Hooker which was issued from 1862 to 1883. George Bentham is undoubtedly in certain qualities of acuteness of intellect and in analytical power the premier of all plant systematists. Joseph Hooker was in range of his mind and wide and progressive grasp of problems the great botanical intellect of the Nineteenth Century. Of all systematic works the *Genera Plantarum* is at once the most thorough, the most even, the most complete, bearing evidences of the most profound discernment, the soundest judgment, the most scholarly finish. It has had a vast influence on the progress of systematic botany, since no other work equals it in the excellence of its taxonomic judgments and in the precision which is given to families and genera. And yet in regard to it one must make a most extraordinary statement. Brought out at a time when the whole scientific world was stirred by the ferment of the evolutionary theory, it contains no hint of ideas of phylogeny or of progressive differentiation.

This amazing fact can only be explained in one way. Bentham was much the elder of the two men and he undoubtedly dominated the work in this particular. The mold of his mind had been cast before the epochal period of Charles Darwin and he did not respond in this particular to the thundering call of a new day. Joseph Hooker on the other hand, the younger man, was a pronounced evolutionist, the friend and confidant of Darwin, a man to whom Darwin unfolded his problems, his plans, his hundreds of detailed queries, for advice and assistance in regard to the plant world.

The *Genera Plantarum* is therefore cold and inflexible; it is in its spirit rather a treatise on mathematics than a work dealing with the field of life. There is lacking in it the expression of all theories of phylogeny or heredity or variation. A century before, Bernard de Jussieu, in the *Jardin des Plantes* at Paris, worked out in his flower beds the beginnings of a natural system, but he refused to publish a theory concerning it. It may be that he was right, that his results developed farther, carried farther, as being freed from the chains of theory. It is possible that in the end Bentham and Hooker may be equally justified.

I now return to the beginning of the Nineteenth Century to consider the work of four men, Robert Brown, Wilhelm Hofmeister, Stephen Endlicher and Charles Darwin, as furnishing the foundation for the great work of Engler and Prantl, *Die Natürlichen Pflanzenfamilien*, put forth within the last 30 years. Robert Brown discovered that the ovules of certain conifers were naked and established gymnospermy as one of the most remarkable facts in the plant world, especially as it led on to important researches by other botanists. The Gymnosperms were thus segregated from Dicotyledons and later established as a distinct coordinate class. Alexander von Humboldt called Robert Brown easily the first of botanists. He distinguished in his monographs more clearly than had ever been done before between morphological characters of systematic value and physiological adaptations, but he promulgated no theory of classification and proposed no system, and yet he is considered one of the profoundest botanists. Hofmeister worked out the life-cycles and antithetic alternation of generations which occur in liverworts,

mosses, ferns and conifers and definitely determined two critical points as represented by a single cell in the life cycle of each, namely the spore and the fertilized egg-cell and showed the essential homology of the sporophytic stages and the sexual stages in all these groups. His results were truly of vast and far-reaching importance in systematic botany, because no one could doubt thereafter that there is a genetic affinity running through these great divisions of plants. The main outline of the theory has since been successfully extended to the flowering plants. I should like to stress the point, however, that Hofmeister himself does not propose any such genetic theory but is content to state his results clearly, concisely and convincingly. He has been called the master genius of descriptive botany and there is no difference of opinion amongst any class of botanists as to the place accorded him in botanical history. S. L. Endlicher was the author of a *Genera Plantarum* in which the groups were described with great ability and clearness and fullness, the characters which bring families, genera and species into connection were set forth in such a way that this work was for reference of the greatest use to all subsequent investigators. For us in California the name of Endlicher has an especial interest since it was he who first recognized the Redwood as a distinct generic type and erected for it the genus *Sequoia*.

The middle years of the Nineteenth Century witnessed the high tide of development of the science of plant morphology and has been called the Heroic Age of Plant Morphology. The brilliant work in systematic botany and the fragments of the natural system as worked out came into the hands of and was used in important arguments by Charles Darwin, author of the "Origin of Species," and produced that tremendous ferment in the biological sciences which is evidently destined to continue for so long a period. Morphology henceforth became the servant of phylogeny.

The only general work which presents one entire view of the plant kingdom was projected by Adolf Engler and Karl Prantl under the title *Die Natürlichen Pflanzenfamilien*, the Natural Families of Plants. Begun in 1889 and finished in 1908 it is in every way colored by the doctrine of evolution. While arranged after a theory of phylogenetic sequence it has also the great merit of presenting not only the systematic characters of the families but their special physiology, histology, biology, embryology, geographic distribution and similar matters as well. The linear sequence begins with the Gymnosperms which, it is agreed, both by the morphological and geological evidence, are the oldest seed plants. Most probably they are derived from Pteridophytes independently, and are in themselves polyphyletic and not monophyletic. Monocotyledons, occurring at the end of the Bentham and Hooker series, are placed next by Engler and Prantl. At the beginning of the Dicotyledenous series they place the catkin-bearing families, the oaks and their allies, followed by the nettles, buckwheats, chenopods and other apetalous families. The dicotyledenous series ends with Compositae where it undoubtedly should be placed.

The sequence of families, as represented in this little text, is in a way, in part, a reversion to the system of Bentham and Hooker, but with an

entirely different interpretation. Gymnosperms are without question, placed first as the most primitive of seed plants. DeCandolle, as Bentham and Hooker after him, set Ranunculaceae at the very beginning of the plant series because they represented his ideal type. We place Ranunculaceae at the beginning of the Dicotyledons because the parts of the flower in all circles (or spirals) are free and distinct, and this condition is regarded as the most primitive. The group of catkin-bearing families, represented by the oaks and their allies, and the apetalous families, such as the Polygonaceae and Chenopodiaceae, which Engler and Prantl placed near the beginning of the Dicotyledons, we have scattered through the choripetalous orders nearest their presumed allies. Compositae is placed at the end of the Dicotyledons because there is, in this family, the greatest amount of coherence and adnation in the flower. The preponderance of evidence at the present time indicates that Monocotyledons are less primitive than Dicotyledons and we place them at the end of the sequence, with the families, as appearing in Bentham and Hooker, almost reversed, Orchidaceae being placed last, because there is here an epigynous flower of considerable complexity.

Since this small flora involves by no means all the natural families, the brief tabulation given below is intended to do no more than arrange systematically the families represented in the following pages. It is however, an arrangement which indicates in a general way some of the tendencies in present day ideas regarding the systematic phylogeny of seed plants.

GYMNOSPERMAE.—CONE-BEARING PLANTS.

Order Coniferales.

Pinaceae.—Pine Family.

Taxodiaceae.—Redwood Family.

Cupressaceae.—Cypress Family.

Taxaceae.—Yew Family.

ANGIOSPERMAE.—FLOWERING PLANTS.

DICOTYLEDONS.

Leaves netted-veined; parts of the flower mostly in 4s or 5s; vascular bundles in a ring around central pith, the stem when perennial increasing in diameter by annual layers; embryo with 2 cotyledons.

A. Choripetalae.—Corolla when present, usually composed of distinct petals.

Order Ranales.

Ranunculaceae.—Buttercup Family.

Calycanthaceae.—Sweet-Shrub Family.

Berberidaceae.—Barberry Family.

Lauraceae.—Laurel Family.

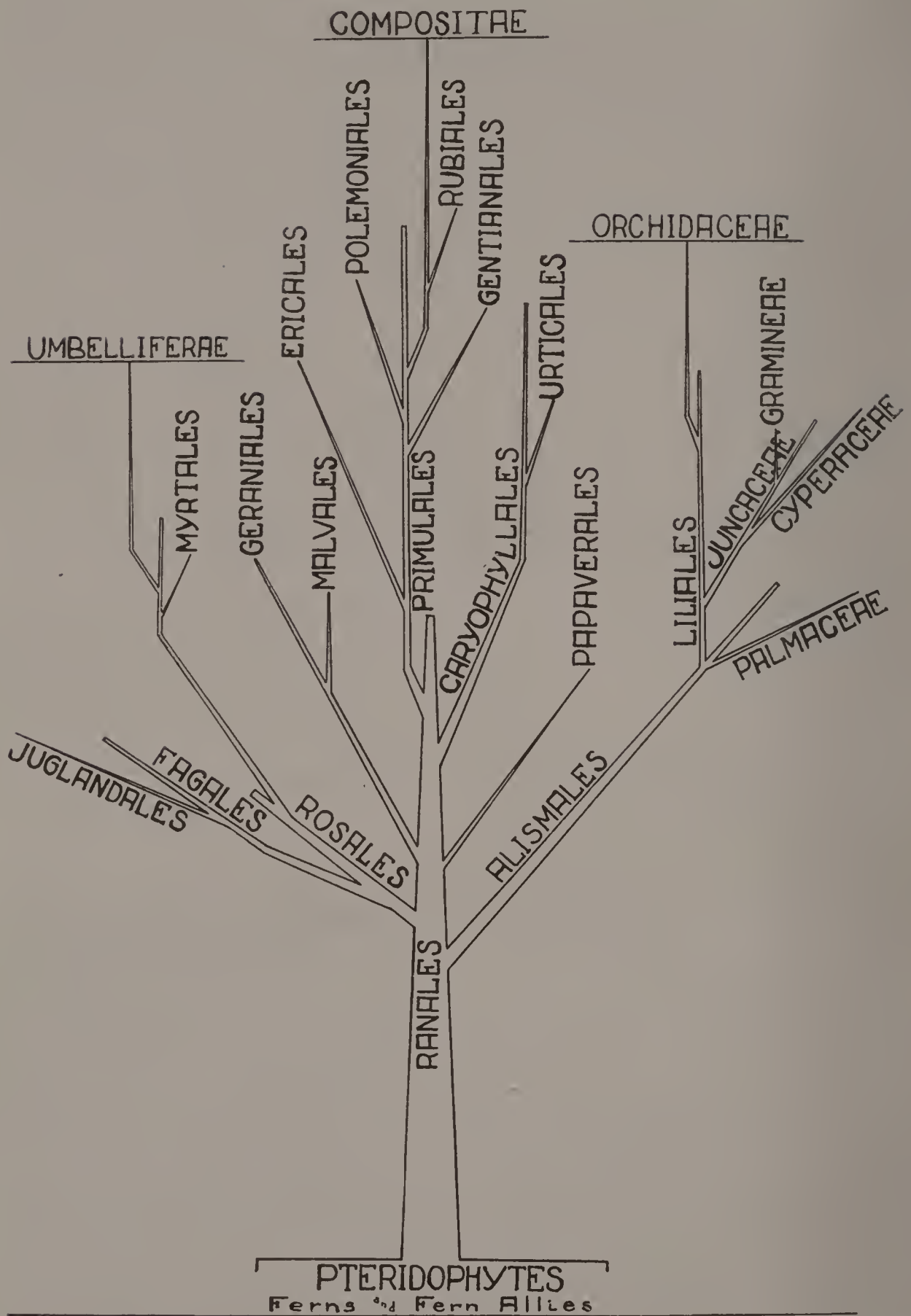


Fig. 1. Evolutionary Tree. A scheme to indicate graphically the probable relationships and origin of the more important natural orders.

Order Papaverales.

- Papaveraceae.—Poppy Family.
- Fumariaceae.—Fumitory Family.
- Cruciferae.—Mustard Family.

Order Caryophyllales.

- Caryophyllaceae.—Pink Family.
- Amaranthaceae.—Amaranth Family.
- Chenopodiaceae.—Goosefoot Family.
- Nyctaginaceae.—Four-o'clock Family.
- Aizoaceae.—Carpet-weed Family.
- Portulacaceae.—Carpet-weed Family.
- Frankeniaceae.—Frankenia Family.
- Salicaceae.—Willow Family.

Order Polygonales.

- Polygonaceae.—Buckwheat Family.
- Saururaceae.—Lizard-tail Family.

Order Aristolochiales.

- Aristolochiaceae.—Birthwort Family.

Order Urticales.

- Ulmaceae.—Elm Family.
- Urticaceae.—Nettle Family.
- Moraceae.—Mulberry Family.
- Cannabaceae.—Hemp Family.

Order Geraniales.

- Zygophyllaceae.—Caltrops Family.
- Oxalidaceae.—Oxalis Family.
- Geraniaceae.—Geranium Family.
- Limnanthaceae.—Limnanthus Family.
- Polygalaceae.—Polygala Family.
- Euphorbiaceae.—Spurge Family.
- Anacardiaceae.—Sumac Family.
- Rutaceae.—Rue Family.
- Simarubaceae.—Quassia Family.
- Meliaceae.—Melia Family.

Order Juglandales.

- Juglandaceae.—Walnut Family.
- Myricaceae.—Sweet-gale Family.

Order Fagales.

- Betulaceae.—Birch Family.
- Corylaceae.—Hazel Family.
- Fagaceae.—Oak Family.

Order Sapindales.

- Sapindaceae.—Buckeye Family.
- Aceraceae.—Maple Family.

Order Rhamnales.

- Vitaceae.—Vine Family.
- Rhamnaceae.—Buckthorn Family.

Order Malvales.

Malvaceae.—Mallow Family.

Order Violales.

Hypericaceae.—St. John's Wort Family.

Cistaceae.—Rock-rose Family.

Violaceae.—Violet Family.

Loasaceae.—Loasa Family.

Cucurbitaceae.—Melon Family.

Order Rosales.

Crassulaceae.—Stone-crop Family.

Saxifragaceae.—Saxifrage Family.

Platanaceae.—Plane Family.

Rosaceae.—Rose Family.

Leguminosae.—Pea Family.

Order Myrtales.

Punicaceae.—Pomegranate Family.

Myrtaceae.—Myrtle Family.

Onagraceae.—Evening Primrose Family.

Order Umbellales.

Cornaceae.—Dogwood Family.

Garryaceae.—Silk Tassle Family.

Araliaceae.—Ginseng Family.

Umbelliferae.—Parsley Family.

B. Sympetalae.—Corolla of united petals.

1. **Pentacyclicae Hypogynae.**—Flower hypogynous, with 5 circles, or if only one stamen circle, then the stamens opposite the corolla-lobes.

Order Ericales.

Ericaceae.—Heath Family.

Order Primulales.

Primulaceae.—Primrose Family.

Plumbaginaceae.—Thrift Family.

Order Ebenales.

Ebenaceae.—Ebony Family.

2. **Tetracyclicae Hypogynae.**—Flower hypogynous, with 4 circles; stamens usually inserted on the corolla.

Order Gentianales.

Oleaceae.—Olive Family.

Gentianaceae.—Gentian Family.

Apocynaceae.—Dogbane Family.

Asclepiadaceae.—Milkweed Family.

Order Polemoniales.

Convolvulaceae.—Morning Glory Family.

Polemoniaceae.—Gilia Family.

Hydrophyllaceae.—Phacelia Family.

Boraginaceae.—Borage Family.
 Labiatae.—Mint Family.
 Solanaceae.—Nightshade Family.
 Scrophulariaceae.—Figwort Family.
 Orobanchaceae.—Broom-rape Family.

Order Plantaginales.

Plantaginaceae.—Plantain Family.

3. **Tetracycliae Epigynae.**—Flowers with four circles epigynous.

Order Rubiales.

Rubiaceae.—Madder Family.
 Caprifoliaceae.—Honeysuckle Family.
 Dipsaceae.—Teasle Family.

Order Campanulales.

Compositae.—Sunflower Family.

MONOCOTYLEDONS.

Leaves with parallel veins; parts of the flower usually in 3s, never in 4s or 5s; vascular bundles scattered irregularly through the pithy tissue, not in rings or annual layers; embryo with one cotyledon; mostly herbs, when perennial chiefly with bulbs or rootstocks.

Order Naiadales.

Alismaceae.—Water-Plantain Family.

Order Pandanales.

Typhaceae.—Cat-tail Family.

Order Palmales.

Palmaceae.—Palm Family.

Order Liliales.

Liliaceae.—Lily Family.
 Amaryllidaceae.—Amaryllis Family.
 Iridaceae.—Iris Family.

Order Graminales.

Juncaceae.—Rush Family.
 Cyperaceae.—Sedge Family.
 Gramineae.—Grass Family.

Order Orchidales.

Orchidaceae.—Orchid Family.

THE LIFE HISTORY OF A FLOWERING PLANT IN THE LIGHT OF ITS RACE HISTORY.

We may begin the life cycle of a flowering plant with the seed which is a resting body. On germination of the seed, if the seedling, as in the case of the bean, shows two cotyledons, then the plant belongs to the class dicotyledon. If on germination only a single leaf first appears above ground, as in the onion or Indian corn, then the plant belongs to the class of monocotyledons.

From its earliest stages the seedling has three primary organs, root, stem and leaf. It seems to be a rule that nature seldom makes a new organ when an existing organ can be modified to do the work in hand. Nearly all vegetative organs are, thus, considered to be modifications of these simple primary organs, root, stem and leaf. In the life history of plants we find development of a great variety of structures. In its adaptations to an endless combination of factors in its habitat the plant has variously modified its primary organs, root, stem, and leaf for varied purposes. The root is used for storage, as in the case of the Soap Plant (*Chenopodium californicum*) or the Man Root (*Echinocystis fabacea*). The stem, which is normally a supporting structure for the display of foliage leaves, is variously modified. It becomes an underground structure, such as a rootstock in the case of Scare-weed (*Stachys bullata*) or Telegraph-Plant (*Heterotheca grandiflora*), structures by which the plant is enabled to retire below ground at unfavorable seasons and at the same time multiply in extent. Similarly we have runners, as in the case of the Beach Strawberry (*Fragaria chilensis*), which are stems modified for reproduction. Other stems are modified for purposes of storage as in the case of the corms of Blue Dick (*Brodiaea capitata*) and Grass Nut (*Brodiaea laxa*), or as in the case of the tubers of Potato (*Solanum tuberosum*). Sometimes, again, stems are replaced by thorns as in Osage Orange (*Maclura pomifera*) or tendrils, as in the species of Man-root (*Echinocystis fabacea*). These various modifications of a typical stem are to be determined as stem structure by observing that they have regular nodes and internodes, or bear buds, or bear leaves, or show unmistakably by their structural position that they are stems.

The earliest foliage leaves borne on the stem of the seedling are almost universally simple, that is, with a single or undivided blade. A compound leaf is one in which the blade is divided up into two or more parts or leaflets; it is regarded, within a given group, as being a development from the simple leaf. In the life history of those species that bear compound leaves, simple leaves at an early stage precede compound leaves, and it is held that simple leaves preceded compound leaves in the race history. When the leaflets are borne along the axis or prolongation of the petiole, the leaf is called pinnate. When such divisions or leaflets are borne at the top of the petiole the leaf is called palmate. In some cases it is capable of demonstration that palmate leaves are an advance upon the pinnate type, being derived from the latter, as in the case of *Potentilla*, where in most species pinnate leaves are regarded as primitive and the palmate leaves of certain species as derived.

Of the three primary organs the leaf is the more variously modified. The beginning student is likely to think of the leaf as solely a physiological mechanism, as an organ for photosynthesis, and use the term leaf when he means, not leaf, but foliage leaf. As highly important as is the foliage leaf to the existence of the plant it is after all, morphologically, only one kind of leaf. Leaves are modified for storage as in the Tiger Lily (*Lilium pardalinum*) or Checker Lily (*Fritillaria lanceolata*). They are modified in whole or in part for climbing, as tendrils in the case of Giant Vetch (*Vicia gigantea*). Sometimes again leaves are replaced by

spines as in the Cañon Gooseberry (*Ribes californicum*). In the formation of the scales of the winter bud leaves also play an interesting part. Sometimes the scale of the winter bud is the equivalent of a leaf blade, as in the case of the Madroño (*Arbutus menziesii*); sometimes it is the equivalent of a dilated petiole, as in the California Buckeye (*Aesculus californica*); or yet again the scales are stipular, since they occur in pairs, as in the case of the California Hazel (*Corylus rostrata* var. *californica*).

The morphology of an organ can only be determined by studying it carefully, by keeping in mind the following considerations: position, structure, shape, size and color. The first, position, is of very great importance; structure is also of great importance, shape is of some importance, size of slight importance and color almost none at all. The untrained mind, it is interesting to note, takes the importance of these characters in reverse order.

Root, stem, and leaf and their modifications constitute the vegetative organs of the plant and are always to be sharply differentiated from the sexual reproductive organs. The sexual reproductive organ is the flower. Typically it consists of four circles of organs borne upon a receptacle.

1. A calyx consisting of a circle of units called sepals or calyx-lobes.
2. A corolla consisting of a circle of units called petals or corolla lobes.
3. An androecium consisting of a circle of units called stamens.
4. A gynoecium consisting of a circle of units called carpels or simple pistils.

The parts of a typical flower occur in regular circles or spirals with the parts or units alternating regularly, but in the course of evolution the units have been subject to multiplication or diminution or suppression. In general, in a given family, we regard the primitive type of flower as having both stamens and pistils. The loss or suppression of stamens and pistils results in unisexual flowers which we regard as derived. The Meadow Rue (*Thalictrum*) is unisexual in the family Ranunculaceae where perfect flowers are general and where the simplest forms in the family have perfect flowers. A calyx consisting of distinct sepals (chorisepalous) is regarded as more primitive than one with united sepals (synsepalous), just as a corolla with distinct petals (choripetalous) is regarded as more primitive than a flower with united petals (sympetalous).

The carpel has often been likened to a leaf with its two margins united to form a cavity, the midrib corresponding to the dorsal side, the ovules borne along the united or ventral side on specialized tissue which is called a placenta. Such a pistil is called a simple pistil and is considered primitive. If a pistil is compound, that is composed of two or more units or simple carpels, it is considered an advance. Two or more carpels may be united in such a way as to make a single pistil but with 2 or more cells and the placentae diverging from the axis, or the carpels may be united by their margins so as to make a single pistil with only one cell and the placentae borne on the side walls. When two or more carpels are joined to form a single compound pistil the evidence of it is usually readily determined by the student observing the number of stigmas and styles. Sometimes, however, the styles and stigmas are so completely blended

that correct determination of the number of carpels can only be had by studying the number of placentae.

In the course of its phylogeny a flower may become complicated through the union of dissimilar parts. When the stamens are raised about the ovary and borne upon a calyx cup, such a condition, a perigynous flower, is regarded as an advance. Or, again, the ovary may become wholly inferior, with the petals and stamens as if borne on its summit and we have an epigynous flower which is regarded as a still further advance. Yet again, reduction in number of units in the circles, particularly in those of the androecium and gynoecium, results in a still further advance, culminating in such cases as that of the Sunflower Family, where the ovules are reduced to one and the flower conspires to produce a single seed.

The fruit is to be defined as the mature product of the ovule with all its appendages. On account of the diverse variety of parts which enter into the formation of fruits it is impracticable to give a scientific classification of them on the basis of the terms used to designate them, but the more common types may be indicated. A follicle is the product of a simple pistil; it opens along the ventral suture. The true achene is derived from a follicle through reduction of the number of seeds to one, which obviates the necessity of the carpel splitting open; the carpel tissue is retained as a valuable protection to the seed. A legume is a special kind of follicle which splits along both sutures, the ventral and the dorsal. A capsule is the product of an ovary with two or more carpels which may split open in various ways. A capsule is, of course, an advance upon a follicle. If a capsule is derived from an inferior ovary it is a still further advance. If a capsular type of fruit is reduced to a 1-seeded structure and is inferior it is, to a still greater degree, derived and removed from the primitive state. All of these conditions may have their walls specialized into hard or fleshy layers resulting in a great variety of stone fruits or fleshy fruits.

We have thus come around to the seed again, completing the life cycle. The important observation just here is that every stage in the life cycle of the plant is in some way to be interpreted in the light of the evolutionary history of the ancestry of the group to which it belongs.

ABBREVIATIONS.

Am., America.	m., meter.=about 3¼ ft.
Austr., Australia.	mm., millimeter.=1 line, ½ in.
Cal., California.	mt., mountain.
cent., central.	nat., naturalized.
cm., centimeter.=about 5 lines.	n., north, northerly, northward.
Co., County.	Ore., Oregon.
cult., cultivated.	S. Cal., Southern California.
dm., decimeter.=about 4 in.	trop. Am., tropical America.
Eur., Europe.	var., variety.
e., east, easterly, eastward.	w., west, westerly, westward.

SYNOPSIS OF THE FAMILIES.

I. GYMNOSPERMAE.

Ovules naked, not inclosed in an ovary; true flowers none, the stamens and ovules in catkin-like clusters; cone-bearing trees or shrubs, ours evergreen; leaves mostly needle-like or awl-like.

Fruit a woody cone, containing several to many seeds.

Cone-scales overlapping, with a bract at base on lower side; leaves needle-like or narrowly linear; seeds 2 to each scale, bearing a thin wing.....PINACEAE, p. 26.

Cone-scales without bracts.

Leaves linear and 2-ranked in flat sprays, or awl-like and disposed all around the branchlet; cone-scales not overlapping, with broad summits; seeds 2 to 9 to each scale, not winged.....TAXODIACEAE, p. 28.

Leaves minute and scale-like, thickly clothing the branchlets; cone-scales overlapping, or not and with broad summits; seeds 1 to several to each scale, winged or wingless.....CUPRESSACEAE, p. 29.

Fruit berry-like or drupe-like, 1-seeded; leaves linear, in flat sprays.....
TAXACEAE, p. 30.

II. ANGIOSPERMAE.

Ovules enclosed in a sac or ovary, which becomes the fruit and encloses the seed; cotyledons 1 or 2; plants with true flowers, typically with an abbreviated stem (receptacle) bearing regular whorls of floral envelopes and stamens and pistils.

CLASS I.—DICOTYLEDONS

Parts of the flower usually in 5s or 4s; leaves mostly netted-veined; vascular bundles in a ring around a central pith, the stem, when perennial, increasing in girth by annual layers; embryo with 2 cotyledons; tap-roots present in most cases.

I. APETALOUS DIVISION. Corolla wanting; calyx herbaceous, often corolla-like, sometimes wanting.

A. Flowers in catkins (dense scaly spikes); trees or shrubs.

Leaves opposite; flowers dioecious, 1 to 3 in each axil of the connate bracts.....GARRYACEAE, p. 112.

Leaves alternate.

Leaves simple.

Both kinds of flowers in catkins.

- Flowers 1 in the axil of each bract; calyx none.
 Fruit a 1-celled capsule with many downy seeds.....
 SALICACEAE, p. 53.
- Fruit a waxy-coated berry-like nut with 1 seed.....
 MYRICACEAE, p. 70.
- Flowers 2 or 3 in the axil of each bract; calyx present;
 fruit a very small seed-like nut.....
 BETULACEAE, p. 70.
- Staminate flowers in catkins, the pistillate solitary or clustered.
 Fruit a nut enclosed in a leafy tubular involucre.....
 CORYLACEAE, p. 71.
- Fruit a nut set in a scaly cup or bur (acorn or chestnut).....
 FAGACEAE, p. 71.
- Leaves pinnately compound; fruit a nut.....JUGLANDACEAE, p. 69.

B. Flowers not in catkins.

1. TREES, SHRUBS OR WOODY CLIMBERS.

Leaves opposite.

Trees; leaves pinnate.

Stamens 4 or 5; fruit a double samara.....ACERACEAE, p. 74.

Stamens commonly 2; fruit a simple samara.....OLEACEAE, p. 125.

Woody climbers; stamens numerous; sepals 4, petal-like.....

CLEMATIS, p. 34.

Leaves alternate and simple.

Trees or shrubs.

Flowers in ball-like clusters; calyx none.....PLATANACEAE, p. 88.

Flowers not in ball-like clusters; calyx present.

Stamens 4 to 9.

Sap not milky.

Fruit a samara.....ULMACEAE, p. 60.

Fruit not a samara.

Fruit a berry; stamens 4 or 5; anthers opening
 lengthwise.....RHAMNACEAE, p. 75.

Fruit a drupe; stamens 9; anthers opening by
 valves.....LAURACEAE, p. 35.

Sap milky; fruit an aggregate fruit.....MORACEAE, p. 61.

Stamens many to numerous.

Fruit a tailed achene; ovary superior.....

CERCOCARPUS, p. 92.

Fruit a capsule; ovary inferior or partly inferior.....

MYRTACEAE, p. 108.

Woody climber; stamens 6, anthers sessile.....ARISTOLOCHIA, p. 60.

2. HERBS; OVARY SUPERIOR (EXCEPT ASARUM AND AIZOACEAE).

a. Calyx and corolla both wanting.

Stamens and pistils in same flower; flowers in a spike, each flower sub-
 tended by a colored bract, the spike subtended by a conspicuous
 colored involucre.....SAURURACEAE, p. 59.

Stamens and pistils in different flowers; flower-clusters often surrounded by a petal-like involucre so that they resemble a single flower.....
EUPHORBIACEAE, p. 65.

b. Calyx present, green or often corolla-like; corolla wanting.

Stipules present.

Stipules sheathing, scarious; calyx 5 to 6-parted, or of distinct petals, often petal-like; stamens 4 to 9.....POLYGONACEAE, p. 55.

Stipules not sheathing; calyx greenish; stamens 1 to 4.

Ovule pendulous; styles or stigmas 2.....CANNABACEAE, p. 62.

Ovule erect; style and stigma 1.....URTICACEAE, p. 61.

Stipules none.

Pistils more than 1 and distinct.....RANUNCULACEAE, p. 30.

Pistil only 1.

Fruit an achene or utricle; ovary 1-celled.

Leaves opposite or whorled.

Calyx of 6 or 5 distinct or nearly distinct petal-like sepals; stamens 4 to 9.....POLYGONACEAE, p. 55.

Calyx tubular, its base forming a hardened covering to the achene; stamens 3 to 5.....
NYCTAGINACEAE, p. 50.

Leaves alternate or opposite.

Sepals herbaceous or, in unisexual flowers, the pistillate without calyx and enclosed by 2 bracts; bractlets none.....CHENOPODIACEAE, p. 48.

Sepals membranous or scarious; flowers with bractlets...
AMARANTHACEAE, p. 47.

Fruit a capsule.

Ovary inferior.

Leaves opposite or whorled; ovary 1 to 12-celled.....
AIZOACEAE, p. 51.

Leaves basal, reniform or cordate; ovary 6-celled; calyx-lobes 3, caudate.....ASARUM, p. 60.

Ovary superior, 3 or 1-celled.....EUPHORBIACEAE, p. 65.

II. CHORIPETALOUS DIVISION. Calyx and corolla present; petals distinct or nearly so, or merely connivent.

A. Stamens hypogynous (on the receptacle below the superior ovary, or sometimes on the base of the petals).

1. STAMENS MORE THAN 10.

Stamens monadelphous; pistils cohering in a ring around a central axis, or pistil 1 and more than 1-celled.....MALVACEAE, p. 78.

Stamens distinct; all herbs or herb-like except one genus in Papaveraceae.

Pistils more than 1 and distinct, becoming follicles or achenes, rarely a berry.....RANUNCULACEAE, p. 30.

Pistil 1.

Pistil 1-celled, the styles or stigmas more than 1.

Sepals caducous; petals 4 or 6, twice as many as the sepals.....
PAPAVERACEAE, p. 36.

Sepals persistent; petals 5.

Sepals 2; styles 3; low annuals.....CALANDRINIA, p. 51.

Sepals 5, the 2 outer smaller and bract-like; style 1;
perennials.....CISTACEAE, p. 80.

Pistil more than 1-celled; petals 5.....HYPERICACEAE, p. 80.

2. STAMENS 10 OR LESS.

*a. Pistils 4 or 5; herbs.*Pistils 5, more or less united around a central axis, elastically separating
when ripe as 1-seeded carpels.Stipules scarious; carpels tailed by twisted styles.....
GERANIACEAE, p. 63.Stipules none; carpels separating from a very short axis, not tailed.....
LIMNANTHACEAE, p. 64.

Pistils 4 or 5, distinct, becoming follicles.....CRASSULACEAE, p. 84.

*b. Pistil 1, the styles or stigmas often more than 1; herbs,
shrubs or trees.*

Corolla irregular.

Petals 5.

Stamens 10; petals butterfly-like; leaves commonly compound.....
LEGUMINOSAE, p. 95.Stamens 5; lower petal with a spur; leaves commonly simple.....
VIOLACEAE, p. 80.Petals 4, in two dissimilar pairs; sepals 2; stamens 6, slightly united
in two sets.....FUMARIACEAE, p. 38.

Corolla regular.

Ovary 1-celled.

Anthers opening by uplifted valves; petals 6; stamens 6; fruit a
berry or capsule.....BERBERIDACEAE, p. 35.

Anthers opening by longitudinal slits; herbs.

Calyx synsepalous or of 5 distinct sepals.

Leaves opposite; calyx tubular or of distinct sepals.

Placenta central; stamens 5, alternate with the
petals, or 10 (5 alternate, 5 opposite),
rarely fewer; calyx tubular and 5-toothed,
or of 5 distinct sepals; capsule 3 to 10-
valved or -toothed, or the fruit 1-seeded
and indehiscent...CARYOPHYLLACEAE, p. 44.Placentae parietal; stamens 4 to 7; calyx tubular,
4 or 5-toothed; capsule 2 to 4-valved.....

FRANKENIACEAE, p. 53.

Leaves basal; calyx funnelform; stamens 5, opposite the petals; fruit an achene.....

PLUMBAGINACEAE, p. 124.

Calyx of 2 distinct sepals; stamens commonly 5; capsule 3-valved.....

PORTULACACEAE, p. 51.

Ovary more than 1-celled.

Anthers opening by pores at the summit; petals 5; ovary 5-celled.....

ERICACEAE, p. 120.

Anthers opening by longitudinal slits.

Herbs (ours).

Leaves alternate or basal.

Sepals and petals 4; stamens 4 long and 2 short; ovary 2-celled, rarely 1-celled.....

CRUCIFERAE, p. 39.

Sepals and petals 5; stamens 10; ovary 5-celled.....

OXALIDACEAE, p. 63.

Leaves opposite; sepals and petals 5; stamens 10.....

ZYGOPHYLLACEAE, p. 63.

Shrubs; leaves opposite, pinnate; stamens and petals 2; pod winged.....

OLEACEAE, p. 125.

B. Stamens perigynous (on the calyx) or epigynous ("on the ovary").

1. *Ovary superior (free from the calyx).*

Filaments distinct.

Stamens 10 to numerous.

Leaves alternate, simple or often compound; petals 5.

Pistils few to many (sometimes only 1), always simple and distinct with one stigma; stipules present (except *Holodiscus* and *Osmaronia*).....

ROSACEAE, p. 88.

Pistil 1 with 3 styles or stigmas; stipules none.....

SCHINUS, p. 67.

Leaves opposite, simple; petals many; pistils many; stipules none; shrubs.....

CALYCANTHACEAE, p. 34.

Stamens less than 10; trees or shrubs.

Stamens 4 or 5, as many as the petals.

Stamens alternate with the petals.

Styles or stigmas 3; fruit drupe-like.....

ANACARDIACEAE, p. 66.

Style 1.

Leaves punctate; fruit a berry (or hesperidium) or a dry fruit in the native species.....

RUTACEAE, p. 68.

Leaves not punctate; fruit a samara.....

SIMARUBACEAE, p. 69.

Stamens opposite the petals.

Shrubs; petals often hooded; ovary 3 or 2-celled.....

RHAMNACEAE, p. 75.

- Woody vines climbing by tendrils; ovary 2-celled.....
VITACEAE, p. 74.
- Stamens 4 to 9.
Leaves palmately compound; style 1; fruit a dehiscent pod.....
SAPINDACEAE, p. 74.
- Leaves simple; styles 2; fruit a double samara.....
ACERACEAE, p. 74.
- Filaments united into a tube; petals 5 or 6; pistil 1; leaves compound.....
MELIACEAE, p. 69.
2. *Ovary inferior (more or less adherent to the calyx).*
- Petals 5 or more.
Petals 5.
Stamens as many as or more than the petals.
Stamens more numerous than the petals.
Fruit a pome; trees or shrubs.....ROSACEAE, p. 88.
Fruit a 1-celled capsule opening at the top; herbs.....
LOASACEAE, p. 82.
- Stamens as many or twice as many as the petals (*Whipplea*
has 8 to 12 stamens); ovary rarely free, 2 to 5-
celled, becoming a capsule or berry.....
SAXIFRAGACEAE, p. 85.
- Stamens as many as the petals and
Opposite them; petals hooded; shrubs.....CEANOETHUS, p. 76.
Alternate with them; flowers in umbels or heads; herbs.
Styles 5; petals not inflexed at tip; fruit berry-like;
stems solid.....ARALIACEAE, p. 112.
Styles 2; petals inflexed at tip; fruit splitting into 2
one-seeded carpels; stems commonly hollow.....
UMBELLIFERAE, p. 113.
- Petals 5 to 7; stamens numerous; fruit many-celled, fleshy.....
PUNICACEAE, p. 107.
- Petals 4.
Stamens 4; flowers small, in cymes, or if in a head, surrounded by
conspicuous petal-like bracts; trees or shrubs.....
CORNACEAE, p. 111.
Stamens 8, rarely 4; flowers mostly showy, in spikes or racemes or
solitary; herbs.....ONAGRACEAE, p. 108.

III. SYMPETALOUS DIVISION. Calyx and corolla both present; corolla with the petals united into a cup or tube, at least at base.

A. Ovary superior (free from the calyx).

1. COROLLA REGULAR.

a. *Anthers opening by a hole at the top.*

- Stamens free from the corolla; ovary 3 to 10-celled.....ERICACEAE, p. 120.
Stamens inserted on the corolla; ovary 2-celled.....SOLANUM, p. 140.

b. *Anthers opening by a longitudinal slit.*

Stamens 10 to many.

Pistil one.

Stamens many, monadelphous; fruit a capsule or the carpels separating at maturity.....MALVACEAE, p. 78.

Stamens 8 to 16, distinct; fruit a berry.....EBENACEAE, p. 124.

Pistils 4 or 5, distinct; stamens 10.....CRASSULACEAE, p. 84.

Stamens 5 or fewer, inserted on the corolla.

Pistil 1.

Stamens as many as the lobes of the corolla and opposite them (Trientalis has sometimes 6 or 7 stamens).....

PRIMULACEAE, p. 123.

Stamens as many as or fewer than the lobes of the corolla and alternate with them.

Corolla colored, not dry-scarious; fruit not opening by a lid.

Ovary 1, 2, or 3-celled.

Corolla 5-lobed; stamens 5.

Style not 3-cleft; ovary 1 or 2-celled.

Styles 2, more or less distinct; ovary 1 or 2-celled...HYDROPHYLLACEAE, p. 131.

Style 1 or none; ovary 2-celled; leaves alternate.

Calyx of 5 distinct or nearly distinct sepals; twining or trailing plants

CONVOLVULACEAE, p. 127.

Calyx 5-toothed or -cleft; mostly erect plants.....SOLANACEAE, p. 139.

Style 3-cleft; ovary 3-celled, the flower otherwise with the parts in 5s.....

POLEMONIACEAE, p. 128.

Corolla 4-lobed; leaves opposite, simple.

Ovary 1-celled; fruit a capsule; leaves opposite, simple, sessile...GENTIANACEAE, p. 125.

Ovary 2-celled; fruit a drupe; leaves petioled.....

OLEACEAE, p. 125.

Ovary 4-celled, commonly 4-lobed, splitting when ripe into as many nutlets; stamens 5; style 1; flowers in coiled spikes or racemes.....

BORAGINACEAE, p. 133.

Corolla dry-scarious; capsule opening by a lid; ovary 2 or 4-celled; stamens 2 to 4; style 1.....

PLANTAGINACEAE, p. 149.

Pistils 2, (the ovaries distinct but the styles or stigmas united); herbs with milky juice.

Stamens and stigmas united, the columns bearing hood-like appendages.....ASCLEPIADACEAE, p. 126.

Stamens and stigmas not united; no hoods...APOCYNACEAE, p. 126.

2. COROLLA IRREGULAR.

- Stamens 10; corolla papilionaceous, that is pea-like; ovary 1-celled; style 1, entire; leaves commonly compound.....LEGUMINOSAE; p. 95.
- Stamens less than 10.
- Corolla not 2-lipped.
- Sepals 2; petals 4, in dissimilar pairs; stamens 6.....
FUMARIACEAE; p. 38.
- Sepals 5, unequal; petals 3; stamens 8.....POLYGALACEAE, p. 65.
- Corolla strongly 2-lipped or often only slightly irregular; stamens 4 or 2.
- Fruit a capsule; style 1; stigma 2-lobed, rarely entire.
- Ovary and capsule 2-celled; green plants.....
SCROPHULARIACEAE, p. 142.
- Ovary and capsule 1-celled; parasites.....
OROBANCHACEAE, p. 149.
- Fruit splitting into 4 nutlets; style 1, cleft at apex; stems square; herbage with the odor of mint.....LABIATAE, p. 135.

B. Ovary inferior (adherent to the calyx).

- Stamens distinct, 4 or 5, rarely 2.
- Ovary 1-celled; flowers in involucrate heads or short spikes; herbs.....
DIPSACEAE, p. 153.
- Ovary more than 1-celled.
- Ovary 2-celled; flowers regular; herbs or shrubs.....
RUBIACEAE, p. 150.
- Ovary 2 to 5-celled; flowers regular or irregular; erect or twining shrubs.....CAPRIFOLIACEAE, p. 151.
- Stamens united into a tube around the style.
- Flowers not in heads.
- Stamens 3; leaves palmately lobed; tendril-bearing herbs.....
CUCURBITACEAE, p. 82.
- Stamens 5; leaves narrow; annuals.....LOBELIACEAE, p. 153.
- Flowers collected into a head and furnished with a calyx-like involucre, the whole resembling a single flower; stamens 5.....
COMPOSITAE, p. 154.

CLASS II.—MONOCOTYLEDONS

Parts of the flower usually in 3s; leaves parallel-veined (except Trillium); ours chiefly herbs, when perennial mostly with bulbs or rootstocks.

A. Perianth none or calyx-like with scale-like divisions.

- Flowers not in the axils of dry chaffy bracts.
- Reed-like plants; inflorescence a dense cylindrical spike.....
TYPHACEAE, p. 172.
- Trees; flowers on a spadix or fleshy spike.....PALMACEAE, p. 172.

- Flowers in the axils of dry chaffy bracts, arranged in spikes or spikelets.
 Stems mostly terete, hollow; leaves in 2 rows; sheaths mostly split
 opposite the blade.....GRAMINEAE, p. 186.
 Stems mostly triangular, solid; leaves in 3 rows; sheaths entire.....
 CYPERACEAE, p. 184.

B. Perianth present, in 2 series, often corolla-like.

Ovaries several, distinct, becoming achenes; perianth of 3 sepals and 3
 petals.....ALISMACEAE, p. 171.

Ovary 1 and
 Superior.

Perianth-segments green or brown, not petal-like; flowers small
 or minute; rush-like plants.....JUNCACEAE, p. 182.

Perianth-segments petal-like, at least the inner; flowers mostly
 showy; plants not rush-like.....LILIACEAE, p. 173.

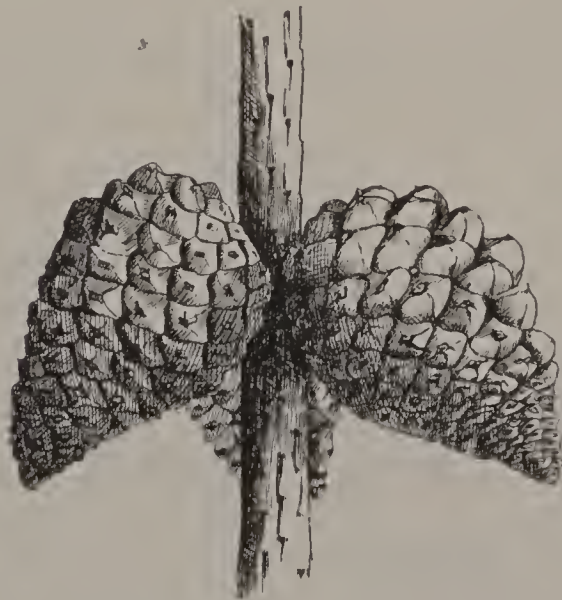
Inferior.

Perianth regular.

Stamens 6; leaves (in ours) fleshy, in a basal rosette.....
 AMARYLLIDACEAE, p. 181.

Stamens 3; leaves 2-ranked, sword-like and sheathing.....
 IRIDACEAE, p. 181.

Perianth irregular; stamens 1, rarely 2...ORCHIDACEAE, p. 206.



Circle of cones of Monterey
 Pine (*Pinus radiata* Don). See
 p. 27.

DIVISION I.—GYMNOSPERMAE

PINACEAE. PINE FAMILY

Trees or shrubs, ours evergreen, with resinous juice. Leaves needle-shaped, linear or awl-shaped. Stamens and pistils in separate flowers, the flowers in cone-like catkins, without calyx or corolla. Fruit a woody cone or sometimes berry-like.—Species about 120, confined to the northern hemisphere, where they are especially characteristic of northerly latitudes or subalpine habitats, thus, in general, favoring the more inhospitable regions of the earth. As timber trees they are for certain qualities not equaled by any other family.

- Cones pendent or spreading, falling from the tree whole, the scales persistent.
Needle-leaves in fascicles; cones maturing second year; bracts minute.....1. PINUS.
Leaves linear; cones maturing first year; bracts obvious, often conspicuous.
Bracts shorter than scales; leaf bases persistent as a peg.....2. PICEA.
Bracts longer than scales; leaf scars smooth.....3. PSEUDOTSUGA.
Cones erect, maturing first year, scales falling separately.....4. ABIES.

1. PINUS L. PINE

Trees with the leaves needle-like and in clusters of 2 to 5, surrounded at base by scarious bud-scales. Cones maturing in the second year, the scales becoming woody and thickened, the bract remaining small and insignificant. Seeds 2 at the base of each scale. (Latin name of the pine.)

- Needles in 5s; tips of the cone-scales not thickened, not armed with a prickle; cones long-stalked.
Needles 2.4 to 9 cm. long; cones 1.4 to 1.9 dm. long.....1. *P. monticola*.
Needles 4.8 to 8.4 cm. long; cones 3 to 4.3 dm. long.....2. *P. lambertiana*.
Needles not in 5s; tips of the cone-scale thickened and armed with a spine or prickle; cones sessile or short-stalked.
Cones breaking through near the base, the lower scales persistent on the tree; needles in 3s.
Cone-scales developed at tip into long spreading talon-like claws or spurs.
Cones long-ovate, 2.4 to 3 dm. long; needles erect, 1.2 to 3.3 dm. long; trunk persisting through crown as one main axis; foliage yellowish.....3. *P. coulteri*.
Cones round-oval, 1.4 to 2.4 dm. long; needles drooping, 1.6 to 3.2 dm. long; trunk branching into several secondary axes; foliage gray.....4. *P. sabiniana*.
Cone-scales spiny or prickly, but not developing talon-like spurs; cones ovate, 7.2 to 12 cm. long; needles 1.2 to 2.4 dm. long.....5. *P. ponderosa*.
Cones not breaking through near the base.
Cones opening in the fall after ripening or sometimes tardily opening; cones 2.4 to 4.2 cm. long; needles in 2s.....6. *P. contorta*.
Cones remaining closed and persistent for many years.
Needles in 2s; cones broadly ovate, 4.8 to 7.2 cm. long, often developing stout spurs; seashore.....7. *P. muricata*.
Needles in 3s.
Cones broadly ovoid, 6 to 10.8 cm. long; seashore....8. *P. radiata*.
Cones oblong-ovate, 7.2 to 14.4 cm. long; montane.....9. *P. tuberculata*.

1. *P. monticola* Don. SILVER PINE. Tree 15 to 50 m. high; needles

very slender, 2.4 to 9 cm. long; cones in pendulous clusters of 1 to 7, rather soft, 1.4 to 2 dm. long.—High montane, Sierra Nevada. The wood is similar in quality to Sugar Pine wood.

2. *P. lambertiana* Dougl. SUGAR PINE. Tree 20 to 60 m. high, 1 to 2 m. in diameter; leaves in 5s; cones cylindrical, 2.4 to 4.5 dm. long, pendent from the ends of the horizontally spreading branches.—Higher mountain ranges. The wood is soft, light, straight-grained and very white and satiny when finished. It has a high commercial value and is rapidly becoming scarce.

3. *P. coulteri* Don. BIG-CONE PINE. Tree 11 to 25 m. high with long lower branches; needles in 3s; cones long-ovate, 2.4 to 3.1 dm. long, breaking near the base when falling like cone of Yellow Pine.—Mts. of S. Cal. A useful species for watershed cover.

4. *P. sabiniana* Dougl. DIGGER PINE. Tree 5 to 17 m. high, the main stem freely branching; leaves drooping; cones on short peduncles, oval, 1.4 to 2.4 dm. long.—Dry foothills around the Great Valley. The wood is heavy, coarse-grained, very resinous and warps in seasoning. It is much used for fuel.

5. *P. ponderosa* Dougl. YELLOW PINE. Tree 17 to 57 m. high or more; bark fissured into large plates; leaves in 3s; cones oval, 7 to 12 cm. long, breaking near the base when falling, some of the lower scales persistent on the stem.—Mountain slopes, abundant and widely spread. The wood is fine- and straight-grained, heavy or sometimes light, usually very resinous, pale yellow or reddish yellow. It is extensively used as a structural timber.

6. *P. contorta* Dougl. BEACH PINE. Low tree 1 to 5 m. high; cones narrow, 3.6 to 6 cm. long.—Sea cliffs and beaches, Mendocino Co. and n. Var. MURRAYANA Engelm. Tamrac Pine. Tree 11 to 35 m. high; bark very thin.—Sierra Nevada at higher altitudes, often in swampy meadows. Its wood is not highly esteemed but it will come into use as a substitute timber.

7. *P. muricata* Don. BISHOP PINE. Tree 11 to 23 m. high; cones broadly ovate, 4.8 to 7 cm. long, in persistent circles.—Local along the coast, Mendocino Co., Pt. Reyes, Monterey.

8. *P. radiata* Don. MONTEREY PINE. Tree 7 to 28 m. high with dark bark; cones oval, very one-sided, 7.2 to 12 cm. long.—Monterey; Santa Cruz coast. This tree is extensively planted for slope cover and for shelter. Its wood is used for boxes.

9. *P. tuberculata* Gord. KNOB-CONE PINE. Tree 1 to 8 m. high; cones narrowly ovate, 7 to 14 cm. long, forming persistent circles; scales on outside towards the base with conspicuous knobs.—Rocky slopes in the mountains, localized at middle altitudes.

2. *PICEA* Link. SPRUCE

Trees with linear leaves. Leaves spreading on all sides, eventually falling and leaving a persistent woody base or peg. Cones maturing first autumn, pendent. Scales thin, with shorter bracts. (*Picea*, ancient Latin name, from *pix*, pitch.)

1. *P. sitchensis* Carr. TIDELAND SPRUCE. SITKA SPRUCE. Tree 23 to

57 m. high, 8.6 to 57 dm. in diameter, with drooping branchlets; cones long-oblong, 4.8 to 9.6 cm. long.—Along the coast, Mendocino Co. n. The wood is light, soft, straight-grained and is extensively converted into lumber.

3. **PSEUDOTSUGA** Carr.

Trees with linear leaves, distinctly petioled, spreading more or less widely. Cones pendulous, maturing the first year. Bracts linear, exerted beyond the roundish scales, acutely 2-lobed at apex with a long slender point in the notch. (Greek *pseudos*, false, and Japanese *tsuga*, hemlock.)

1. **P. taxifolia** Britt. DOUGLAS FIR. DOUGLAS SPRUCE. Straight tall tree 14 to 60 m. high or more; cones 4 to 8.4 cm. long.—Mountain slopes, Cal. to B. C. In the lumber trade it is known as "Oregon Pine." The wood is straight-grained, tough, light for its weight and furnishes one of the most important structural timbers in the world for bridges, buildings and ships.

2. **P. macrocarpa** Mayr. BIG-CONE SPRUCE. Tree 8 to 17 m. high or more; cones 9.6 to 18 cm. long.—Mountains of S. Cal.

4. **ABIES** Link. FIR

Tall symmetrical trees. Leaves linear, leaving a smooth circular scar when they fall. Cones erect, maturing the first autumn, falling to pieces on the tree. (The Latin name.)

1. **A. concolor** Lindl. & Gord. WHITE FIR. Tree 17 to 57 dm. high; young bark whitish, old bark gray or drab, heavily fissured; leaves twisted on short petioles; cones oblong, 4.8 to 13 cm. long.—Mountain slopes. The wood is soft, light, coarse-grained, fairly strong and is extensively used for fruit boxes.

2. **A. magnifica** Murr. RED FIR. Tree 17 to 57 m. high; old bark dark red, roughly fissured; leaves not twisted, sessile; cones broadly oval or oblong, 9.6 to 19 cm. long.—Mountain slopes and ridges, Sierra Nevada and high North Coast Ranges. The wood is heavy, strong, fine-grained, durable, reddish, and is valued for bridges and shaft-timbers.

TAXODIACEAE. REDWOOD FAMILY

Trees with linear or awl-shaped alternate leaves. Staminate and ovulate catkins on same tree; bracts none. Fruit a woody cone.—Species 13, widely scattered over the earth.

1. **SEQUOIA** Endl. REDWOOD

Tall trees with thick red bark and linear, ovate-lanceolate or triangular-acute alternate leaves. Cones maturing the second year. Scales at right angles to the axis, cuneate, with a rhomboidal umbilicate apex. (The Cherokee Indian, Sequoyah, who invented an alphabet for his tribe.)

1. **S. sempervirens** Endl. REDWOOD. Tree 30 to 85 m. high; leaves linear, petioled, 8 to 18 mm. long, spreading in 2 ranks or flat sprays; cones ovoid, 1.8 to 2.4 cm. long.—Near the coast, Monterey Co. to sw. Ore. The wood is reddish, soft, remarkably straight-grained, light but strong, free from resin and is applied to numerous uses in buildings,

manufactures and the arts. It is the tallest tree of the earth's silva, reaching an extreme height of 103.6 m.

2. **S. gigantea** Lindl. BIG TREE. Tree 40 to 90 m. high; leaves short ovate or subulate, sessile, spreading spirally and making roundish sprays; cones elliptic-globose, 4.8 to 8.4 cm. long.—Sierra Nevada, at middle altitudes. The wood is similar to Redwood, but pinker and more brittle, and is used for similar purposes. It is in massiveness the largest tree on earth.

CUPRESSACEAE. CYPRESS FAMILY

Trees or shrubs with opposite or whorled scale-like (or rarely linear) leaves thickly clothing the branches. Stamens and ovules in separate catkins. Cone woody or fleshy. Scales few; bracts none.—Species about 80, widely distributed over the earth.

Fruit a woody cone; stamens and ovules on same tree.

Branchlets flattened; cones maturing in first autumn.....1. **LIBOCEDRUS**.

Branchlets cord-like; cones maturing in second autumn.....2. **CUPRESSUS**.

Fruit a berry; stamens and ovules on different trees.....3. **JUNIPERUS**.

1. **LIBOCEDRUS** Endl.

Trees with branchlets in flat sprays. Leaves scale-like, opposite, in four rows, the successive pairs unlike. Cones oblong, with imbricated oblong scales. Seeds 2 at the base of scale. (Greek libas, referring to the trickling of resin, and kedros, cedar.)

1. **L. decurrens** Torr. INCENSE CEDAR. Tree 14 to 36 m. high; cones oblong-ovate, 1.8 to 2.4 cm. long.—Montane. The wood is soft, light, fine- and straight-grained and exceedingly durable in soil or water. It is used for telephone poles and fence posts.

2. **CUPRESSUS** L. CYPRESS

Trees or shrubs with small scale-like opposite leaves thickly clothing the branches. Cones composed of 6 to 10 very thick roundish and peltate scales fitting closely together. Seeds several at the base of each scale. (Classical name of the Cypress.)

1. **C. macrocarpa** Hartw. MONTEREY CYPRESS. Tree 5 to 17 m. high; cones sub-globose, 1.8 to 3.6 cm. long.—Coast at Monterey; very common in cultivation, especially as a hedge-plant.

3. **JUNIPERUS** L. JUNIPER

Trees or shrubs. Leaves in whorls of 3 or opposite, scale-like or linear-subulate. Cones fleshy and berry-like, 1 to 3-seeded. (Ancient Latin name.)

Berries reddish-brown, oblong; medium altitudes.....1. *J. californica*.

Berries blue-black, globose or sub-globose; high montane.....2. *J. occidentalis*.

1. **J. californica** Carr. CALIFORNIA JUNIPER. Shrub 5.7 to 43 dm. high or occasionally a tree up to 11 m. high; berries sub-globose or oblong, with 1 to 3 seeds.—Dry hills and mountain sides, inner ranges and s. to Mohave Desert. The wood is hard and very durable. It is used for fence posts and fuel.

2. **J. occidentalis** Hook. SIERRA JUNIPER. Tree 2 to 13 m. high; berries globose to ovoid, with 2 seeds.—High granite ridges and cirques. The wood is very fine-grained, soft, brittle and exceedingly durable.

TAXACEAE. YEW FAMILY

Trees or shrubs with linear leaves 2-ranked by a twist in their petioles. Stamens and ovules on different trees. Fruit berry-like or drupe-like.—Species about 70, all continents.

Fruit red, berry-like; leaves 1.2 to 1.6 cm. long.....1. **TAXUS**.
Fruit green or purplish, plum-like; leaves 3 to 6 cm. long.....2. **TORREYA**.

1. TAXUS L. YEW

Trees or shrubs. Fruit cup-shaped, fleshy, red, surrounding the bony seed, the whole berry-like. (Ancient Latin name of the yew, probably from Greek toxon, a bow, the wood used for bows.)

1. **T. brevifolia** Nutt. **WESTERN YEW**. Tree 2 to 8 m. high; fruit borne on under side of the sprays.—Deep, shady cañons: Santa Cruz Mts. n.; Calaveras Co. n. The wood is hard, heavy, close-grained, flexible and durable. The native tribes made from it their best bows, just as the bowmen of Henry the Fourth made theirs from the closely allied English Yew. It is now used for tool handles and machine-bearings.

2. TORREYA Arn. STINKING YEW

Trees with rigid sharp-pointed leaves. Fruit drupe-like. (John Torrey, Professor of Botany in Columbia College.)

1. **T. californica** Torr. **CALIFORNIA NUTMEG**. Tree 4 to 14 m. high; fruit elliptical, 2.7 to 4.2 cm. long.—Cool shady cañons: Santa Cruz Mts. to Mendocino Co.; Sierra Nevada. The wood is fine- and close-grained, elastic, very strong and durable. The tree is scarce and the wood so highly prized that it no longer gets into the general market.

DIVISION II.—ANGIOSPERMAE**CLASS I.—DICOTYLEDONS****RANUNCULACEAE. BUTTERCUP FAMILY**

Herbs with alternate leaves (except Clematis). Parts of the flower all distinct and borne on the receptacle. Stamens numerous. Pistils several, 1-celled. Fruit a pod, achene or rarely a berry. Sepals often petal-like and petals none.—About 680 species, mainly in north temperate and sub-arctic regions.

Ovary several to many-ovuled; fruit a follicle or berry; herbs.

Flowers regular.

Petals not spurred.

Flowers solitary, rarely 2 to 3, large; petals 5 or 6, brownish-red1. **PAEONIA**.

Flowers many, in racemes, white; petals 1 to 10, minute or none.....
2. **ACTAEA**.

Petals 5, prolonged backward into hollow spurs.....3. **AQUILEGIA**.

Flowers irregular, complete; petals 4; upper sepal strongly spurred.....
4. **DELPHINIUM**.

Ovary usually with one ovule; fruit an achene.

Leaves alternate or basal; herbs.

Petals none.

Cauline leaves in a single involucrel whorl of 3; flowers perfect, mostly large, the sepals petal-like.....5. **ANEMONE**.

- Cauline leaves alternate; flowers inconspicuous, unisexual, commonly dioecious, the sepals greenish.....6. THALICTRUM.
 Petals present, with a nectar-pit on claw; achenes crowded on a convex receptacle so as to appear capitate.....7. RANUNCULUS.
 Leaves opposite; flowers polygamous; woody climber.....8. CLEMATIS.

1. PAECNIA L.

Leaves ternately compound. Flowers large, solitary and terminal. Sepals and petals 5 or 6, the petals and the numerous stamens borne on a fleshy disk which is attached to the base of the calyx. Pods 2 to 5, thick and leathery. (Paion, the physician of the gods.)

1. *P. brownii* Dougl. PEONY. Somewhat fleshy plant, 2.2 to 2.8 dm. high; leaves chiefly basal; peduncles 2.4 to 4.8 cm. long; petals dull red, thick and leathery, scarcely longer than the roundish concave sepals; pods 2.4 to 3.6 cm. long.—Brushy hillslopes.

2. ACTAEA L.

Leaves once or twice ternately compound, ample. Flowers small, white, in a terminal raceme. Sepals about 4, early falling. Petals small and narrow or none. Stamens many with small anthers and slender white filaments, which are more showy than the petals. Pistil 1, becoming a berry. (Latin name of the elder, transferred by Linnaeus to these plants.)

1. *A. spicata* L. var. *arguta* Torr. BANE BERRY. Stems clustered, 4.3 to 14.4 dm. high, from stout rootstocks; leaves mostly basal, 2.8 to 5.7 dm. long; leaflets deeply cut and sharply serrate; berry red or white, nearly globose.—Forests or wooded hills.

3. AQUILEGIA L.

Leaves chiefly basal, ternately compound. Flowers solitary, showy. Sepals 5, of the same color as the petals. Petals 5, all alike and with large spurs projecting backward. Some inner stamens sterile and reduced to scarious scales. Pistils 5, becoming several-seeded pods. (Derivation doubtful, said by some to be from the Latin aquila, an eagle, on account of the claw-like spurs.)

1. *A. truncata* F. & M. COLUMBINE. Stems 5.7 to 8.6 dm. high; leaflets roundish, incised and toothed above; flowers scarlet, tinged with yellow, hanging; spurs about 1.8 cm. long.—Shady and rather moist places in the hills.

4. DELPHINIUM L. LARKSPUR

Leaves palmately lobed or divided. Flowers in terminal racemes. Sepals 5, the upper one spurred at base. Petals 4, in pairs, the upper pair with nectar-bearing spurs which are hidden in the spur of the calyx. Pistils commonly 3. (Greek delphinion, Larkspur, derived from delphin, the flowers of some species resembling the classical figures of the dolphin.)

Flowers red.

Leaves divided into narrowly linear or lanceolate divisions; stem leafy.....
 1. *D. cardinale*.

Leaves parted into broad divisions; stem few-leaved.....2. *D. nudicaule*.

Flowers blue, white, pink or lavender.
 Root a globose tuber or a cluster of fleshy roots.....3. *D. decorum*.

Root a cluster of hard woody, often fusiform fibres.

Petioles hirsute with spreading hairs, mostly short.....4. *D. variegatum*.

Petioles finely canescent.

- Sepals densely pubescent on the back; leaf-lobes short; chiefly west-central Cal.5. *D. hesperium*.
 Sepals lightly pubescent on the back; leaf-lobes long; chiefly S. Cal.6. *D. parryi*.

1. ***D. cardinale*** Hook. SCARLET LARKSPUR. Stems stout, 8.6 to 17 dm. high; leaves deeply and sharply twice cut into mostly very narrow divisions; raceme many-flowered, 1.4 to 4.3 dm. long; flower bright scarlet with yellow center.—S. Cal.

2. ***D. nudicaule*** T. & G. RED LARKSPUR. Stems 2.8 to 5.7 dm. high, rather slender; leaves somewhat succulent, mostly basal, 3 to 5-lobed or -divided into broad cleft or toothed divisions, each lobe with a short blunt cuspidation at apex; raceme about 2 to 12-flowered; flowers red.—Shady mountain sides.

3. ***D. decorum*** F. & M. Almost glabrous; basal leaves somewhat succulent, roundish, 3 to 5-lobed or -parted into wedge-shaped lobed or nearly entire segments; petioles short; upper leaves divided into narrow lobes; racemes commonly many-flowered, the spreading pedicels 1.2 to 4.8 cm. long; sepals blue, 1.2 to 1.8 cm. long; pods erect (or the tips spreading).—Open woods.

4. ***D. variegatum*** T. & G. ROYAL LARKSPUR. Stem simple or sometimes branching, 2.8 to 4.3 dm. high; leaves deeply cut into narrowly oblong diverging segments; raceme loosely 3 to 10-flowered, the pedicels ascending or spreading; sepals deep blue, 1.2 to 2.4 cm. long, the spur often slightly curved at tip.—Low open foothills.

5. ***D. hesperium*** Gray. WESTERN LARKSPUR. Stem simple, 4.3 to 7.2 dm. high; raceme rather dense, often wand-like, 1.4 to 2.8 dm. long, the pedicels strictly erect; sepals blue, white, or pink, 8 to 12 mm. long, the spur straight.—Plains and foothills. Var. **RECURVATUM** Jepson. Leaves with narrower more acute divisions; flowers pink-lavender or lavender-white; sepals recurving.—Low, alkaline lands.

6. ***D. parryi*** Gray. Stems simple, 2.8 to 7.9 dm. high; leaves twice divided and redivided into narrowly linear lobes; racemes wand-like, often cylindrical, 9.6 to 33.6 cm. long; flowers blue or light purplish, rarely white; angles of seed winged.—S. Cal. Var. **MARITIMUM** Dav. Commonly branching, pedicels longer; flowers large; angles of seed not winged.—Coast region, S. Cal.

5. ANEMONE L. WIND-FLOWER

Stem simple, from a rootstock. Leaves basal except a single whorl (involucre) below the solitary or umbellate flowers. Sepals 5 or more, petal-like. Petals none. Stamens numerous. Achenes many, ours short-pointed. (Greek anemos, wind, the flowers disturbed by the wind.)

1. ***A. quinquefolia*** L. var. **grayi** (Greene) Jepson. Stems slender, 9.6 to 28.8 cm. high; involucreal leaves with 3-(or sometimes 5-) toothed leaflets; basal leaf 1; flowers white, 1.2 to 1.8 cm. broad; sepals about 6.—Shady woods, Santa Cruz Co. to Siskiyou Co.

6. THALICTRUM L. MEADOW RUE

Herbs with tall stems from a short rootstock bearing 2 or 3 times ternately compound leaves. Flowers many, small, in a terminal panicle, the staminate and pistillate on different plants. Sepals 4 to 7, more or less

greenish. Petals none. Anthers on thread-like filaments. Fruit an achene, tipped with the style. (Greek thallo, to grow green, the application uncertain.)

1. **T. polycarpum** Wats. Plants 3.6 to 8.6 dm. high; leaflets ovate to roundish, serrate, incised or divided into 2 or 3 segments; stamens 16 to 25; achenes of about the same number, the sides marked with interlacing veins.—Hills and narrow valleys.

7. RANUNCULUS L. BUTTERCUP. CROWFOOT

Stem usually freely branching, the flowers solitary or in clusters at the ends of the branches. Leaves basal or alternate. Flowers yellow (sometimes white). Sepals 5. Petals 5, each with a nectar-bearing pit at base. Stamens numerous. Pistils many, becoming a globose cluster of flattish achenes pointed or beaked by the persistent style. (Latin name for a little frog, some species growing in wet places where frogs are found.)

Petals yellow; nectar-bearing pit covered by a scale.

Achenes with a firm close coat, not loose or utricular.

Achenes not spiny, nor with hooked hairs.

Leaves simple, entire; stems filiform, creeping.....1. *R. flammula*.

Leaves (or some of them) toothed, lobed or divided.

Beak of the achenes commonly curved, shorter than the body.

Petals 9 to 16; beak rather closely recurved.....

2. *R. californicus*.

Petals 5 or 6; beak more or less erect.....3. *R. occidentalis*.

Beak of the achenes straight, as long as the body....4. *R. bloomeri*.

Achenes prickly, or with stiffish hooked hairs.

Flowers minute, the petals only as long as the stamens; achenes with hooked hairs.....5. *R. hebecarpus*.

Flowers medium, the petals much longer than the stamens; achene spiny-muricate, with raised border.....6. *R. muricatus*.

Achenes with a thin coat, striate; stems creeping.....7. *R. cymbalaria*.

Petals white; nectar-bearing pit not covered by a scale; aquatic; leaves immersed, filiform-dissected.....8. *R. aquatilis*.

1. **R. flammula** L. var. **reptans** E. Mey. SPEARWORT. Stems slender, reclining or creeping, rooting at the joints, 9.6 to 14.4 cm. long; leaves lanceolate or linear-lanceolate, entire, 2.4 to 4.8 cm. long; tapering below into a petiole; flowers 4 to 8 mm. broad; petals 5; achenes few, the beak short and stout.—Margins of pools or streams.

2. **R. californicus** Benth. COMMON BUTTERCUP. Freely branching plant with several to many clustered stems (1.2 to 4.8 dm. high) and mostly basal leaves; leaves roundish in outline, ternately divided and again divided or lobed, the earlier with broad divisions, the later with sharply cleft narrowly linear divisions; petals 9 to 16, 8 to 10 mm. long; achenes with short stout closely recurved beak.—Open hills and valleys.

3. **R. occidentalis** Nutt. var. **eisenii** Gray. Stems slender, erect, 2.8 to 4.3 dm. high; herbage with spreading hairs or subglabrous; basal leaves roundish, 3 or 5-cleft or -parted; upper with linear segments; petals 5 or 6; beak of achenes slender, rather closely recurving.—Sierra Nevada and Coast Range foothills.

4. **R. bloomeri** Wats. Glabrous succulent herb with stems 1.4 to 3.6 dm. high; leaves simple or mostly with 3 leaflets, long-petioled; leaflets roundish, coarsely dentate or incised; flowers few, 3 cm. broad or less;

petals 5, notched at apex and with a greenish area at base.—Low wet places in valley fields.

5. *R. hebecarpus* H. & A. Very slender sparsely hairy herb 1.2 to 2.6 dm. high; leaves thin, round or kidney-shaped in outline, parted or divided into 3 entire or lobed divisions; petals minute, of the same length as the stamens; achenes few, covered with short hooked hairs.—Open woods.

6. *R. muricatus* L. Stout, glabrous and succulent, 7.2 to 24 cm. high; herbage yellowish green; leaves round or kidney-shaped, deeply 3-cleft into cleft or toothed lobes; petals 6 to 8 mm. long; achenes 8 mm. long, including the sword-shaped beak, the sides with coarse prickles and surrounded by a raised border.—Nat. from Eur.

7. *R. cymbalaria* Pursh. Flowering stems naked, 7.2 to 14.4 cm. long; leaves basal and at the joints of the long thread-like rooting runners, broadly ovate or ovate-cordate, coarsely crenate; petals 5 to 9, 2 to 8 mm. long; achenes with bladdery walls, the sides nerved, borne on an elongated receptacle and forming an oblong cluster 6 to 12 mm. long.—Wet saline places.

8. *R. aquatilis* L. WATER BUTTERCUP. Leaves submersed, many times dissected into thread-like or hair-like divisions; flowers 6 to 14 mm. broad; achenes wrinkled crosswise.—Ponds and ditches.

8. CLEMATIS L. VIRGIN'S BOWER

Stems woody below, climbing by aid of the petioles of the opposite compound leaves. Sepals 4, white and petal-like. Petals none. Stamens numerous. Fruit consisting of a cluster of numerous achenes, the styles persistent as hairy or feathery tails and very conspicuous in the fruiting stage. (Ancient name, from Greek klema, a twig.)

1. *C. lasiantha* Nutt. PIPE-STEM. Leaflets 3, elliptic or roundish, coarsely toothed and often 3-lobed, 2.4 to 4.8 cm. long; peduncles bearing 1 to 3 flowers which are 3 to 5.4 cm. broad; sepals broadly oblong; tails of the achene 2.4 cm. long or more forming a head-like cluster 4.8 to 6 cm. broad.—Clambering over shrubs in the foothills.

2. *C. ligusticifolia* Nutt. HILL CLEMATIS. Leaflets 5 to 7, variable, 3-lobed or coarsely toothed; peduncles bearing a cluster or panicle of many flowers; flowers 1.2 cm. in diameter; sepals narrowly oblong, acute; fruiting panicles 7.2 to 36 cm. long.—Wooded hills.

CALYCANTHACEAE. SWEET-SHRUB FAMILY

Aromatic shrubs with opposite entire leaves. Bracts, sepals and petals passing into each other, all (with the numerous stamens) adnate to or inserted upon the enlarged hollow receptacle which is like a rose-hip. Pistils many, becoming achenes.—Species 4, North America and Asia.

1. CALYCANTHUS L.

Flowers livid red. Petals in several rows. Inner stamens sterile. (Greek kalyx, covering or calyx, and anthos, flower.)

1. *C. occidentalis* H. & A. SWEET-SHRUB. Erect branching shrub 1 to 2 m. high; leaves ovate to oblong-lanceolate, acute at apex, 3.6 to 14.4 cm. long; sepals and petals linear-spatulate, 1.8 to 3 cm. long.—Cañon streams. A crushed flower is used as a handkerchief perfume by mountain people.

BERBERIDACEAE. BARBERRY FAMILY

Shrub or herbs, ours with alternate compound leaves. Flowers perfect, regular. Sepals 6, in 2 circles. Petals 6, in 2 circles, the stamens as many and opposite them. Anthers opening by uplifting valves or lids. Ovary superior, 1-celled.—Species about 130, widely distributed.

Shrubs or low woody plants; leaves pinnate, prickly; petals bifid.....1. BERBERIS.
Perennial acaulescent herbs; leaves triternate; petals entire.....2. VANCOUVERIA.

1. BERBERIS L. BARBERRY

Flowers yellow, in racemes. Sepals petal-like. Fruit a berry. (Arabic name.)

Filaments with a pair of recurved teeth near the apex; racemes short; bud-scales few, deciduous, small; leaflets 3 to 9 (or 13), pinnately veined.

Leaflets with few (5 to 15) teeth; erect shrubs of dry ground; racemes densely many-flowered.....1. *B. californica*.

Leaflets with more numerous teeth.

Foliage not very dense; leaflets shining above, their teeth spine-tipped.....

2. *B. aquifolium*.

Foliage mostly in a dense terminal fascicle; leaflets thin, with numerous bristle-tipped teeth.....3. *B. pinnata*.

Filaments without teeth; racemes elongated; bud-scales large, persistent; leaflets 11 to 21, somewhat palmately veined.....4. *B. nervosa*.

1. *B. californica* Jepson. Stems rigidly erect, 8.6 to 17 dm. high; leaves 3.6 to 9.6 cm. long; raceme 2.4 to 4.8 cm. long.—Dry rocky interior foothills and desert ridges.

2. *B. aquifolium* Pursh. MOUNTAIN GRAPE. Stems erect, 3 to 12 dm. high; racemes fascicled in the axils and at the summit, dense, 2.4 to 4.8 cm. long; berries blue, glaucous, large.—Rocky cañons, North Coast Ranges.

3. *B. pinnata* Lag. CALIFORNIA BARBERRY. Stems erect, stout, branching, 1 to 4 dm. high (or to 14 dm.); leaves 4.8 to 9.6 cm. long; racemes clustered, dense.—Hill summits and slopes, mostly along the edge of thickets.

4. *B. nervosa* Pursh. OREGON GRAPE. Stem simple, scaly, 1.4 to 5.8 dm. high, bearing the leaves in a terminal tuft; leaves 2.2 to 3.8 dm. long; berries blue-glaucous.—Woods near the coast.

2. VANCOUVERIA Morr. & Dec.

Leaves basal or nearly so. Flowers in a panicle on a scape-like peduncle. Petals ligulate-tipped with a hood-like nectar-bearing appendage. Fruit a follicle. (Capt. George Vancouver of the English exploring ship Discovery, who visited San Francisco Bay in 1792.)

1. *V. parviflora* Greene. INSIDE-OUT FLOWER. Stems 2 to 4.8 dm. high, sparsely hairy; leaves persisting through the winter; leaflets 1.8 to 3.6 cm. long; flowers white or lavender-tinged.—Shady woods, Redwood belt.

LAURACEAE. LAUREL FAMILY

Aromatic trees or shrubs with alternate simple leaves, perfect regular flowers (in ours), no corolla, anthers opening by uplifted valves, and fruit a drupe.—This family, consisting of about 1000 species, mostly in tropical forests, is characterized by a volatile oil found in all parts of

the plant, whence the spices of commerce. Important species are *Cinnamomum zeylanicum* Nees (Cinnamon Tree), *C. camphora* N. & E. (Camphor Tree) and *Sassafras officinale* N. & E. (Sassafras). Branchlets of *Laurus nobilis* L., the classical Laurel, were used by the Greeks and Romans to crown victors.

1. UMBELLULARIA Nutt.

Evergreen. Flowers small, in simple umbels. Sepals 6. Stamens 9, the 3 inner with a stalked orange-colored gland on each side of the filament at base and alternating with scale-like staminodia. Anthers 4-celled, 4-valved. Ovary 1-celled, 1-ovuled. (Latin *umbellularia*, a little umbel.)

1. *U. californica* Nutt. CALIFORNIA LAUREL. Tree 5 to 14 m. high, or on hilltops a shrub 1 to 4 m. high; leaves oblong; drupe 2.4 cm. long, brown-purple when fully ripe.—Mountain streams or (near the coast) in valleys. Also called Bay Tree and Pepperwood. The wood is heavy, hard and strong, takes a high polish and is used for furniture and the finest interior finish.

2. PERSEA Gaertn.

Evergreen. Flowers perfect, small, in panicles. Calyx deeply 6-parted. Stamens 9; staminodia 3. (Greek name of an Egyptian tree.)

1. *P. gratissima* Gaertn. f. ALLIGATOR PEAR. AVOCADO. Leaves 7.2 to 36 cm. long; fruit a large pear-shaped fleshy drupe.—Native of Central America, cult. in S. Cal. Var. *DRYMIFOLIA* Mez. Leaves anise-scented; flowers more pubescent; fruit smaller, thin-skinned.—Cult.

PAPAVERACEAE. POPPY FAMILY

Herbs (except *Dendromecon*) with regular flowers. Sepals 2 to 3, early-falling, the petals twice as many. Stamens commonly numerous. Pistil 1; ovary 1-celled, becoming a pod in fruit.—In *Platystemon* the lightly united parts of the pistil become distinct in fruit. In *Eschscholtzia* the 2 sepals are united into a pointed cap. The juice often contains poisonous properties. The family consists of about 80 species, widely distributed in the north temperate zone.

Sepals distinct, caducous; receptacle not hollowed.

Sepals 3; petals 6; leaves opposite or basal; annuals.

Stigmas 6 to many; petals withering-persistent.....1.....PLATYSTEMON.

Stigmas 3; petals deciduous.....2.....MECONELLA.

Sepals 2; petals 4; leaves alternate or basal.

Leaves entire, leathery; shrub.....3.....DENDROMECON.

Leaves lobed or dissected; herbs.

Flowers erect in bud; capsule 4 to 6-valved at summit..4.....ARGEMONE.

Flowers nodding in bud; capsule opening by holes just below summit

5.....PAPAVER.

Sepals united into a calyptra or foolscap body, which is pushed off by the 4 expanding petals; receptacle hollowed.....6.....ESCHSCHOLTZIA.

1. PLATYSTEMON Benth.

Low annual with mainly opposite entire leaves. Filaments of the stamens broad. Pistils 6 to 20, at first joined, in fruit distinct and breaking crosswise into 1-seeded joints. (Greek *platus*, broad, and *stemon*, a stamen.)

1. **P. californicus** Benth. CREAM CUPS. Branched from the base, the branches ascending, 7.2 to 14.4 cm. high; herbage hairy; flowers yellow, on long stalks.—Open hills and plains.

2. **MECONELLA** Nutt.

Resembling *Platystemon*, but sepals sometimes 2 and petals 4. Stamens 6 to 12 or more. Fruit a 3-valved pod. (Greek mekon, poppy, and ella, diminutive.)

Herbage glabrous: stamens 6 to 12; leaves not all basal.....1. *M. oregana*.
Herbage hairy; stamens numerous; leaves all basal or nearly so.....2. *M. linearis*.

1. **M. oregana** Nutt var. **californicus** (Torr.) Jepson. Very slender branching plant 4.6 to 16.8 cm. high; lower leaves roundish or obovate, upper oblanceolate or linear; flower-stalks 4.8 to 7 cm. long, erect at first, in fruit turned downward horizontally; petals white, 6 to 12 mm. long; filaments thread-like or slightly widened upward; pod cylindrical, twisted.—Valleys and low hills.

2. **M. linearis** (Benth.) Jepson. Stemless or nearly so, the flower-stalks scape-like, 9.6 to 19 cm. high; leaves linear; petals light yellow, 8 to 18 mm. long; filaments conspicuously widened; pod 3-lobed.—Valleys and low hills.

3. **DENDROMECON** Benth.

Shrub with alternate entire somewhat leathery leaves and yellow flowers. Stamens numerous. Style short, bearing 2 stigmas. Pod linear and seeds pitted. (Greek dendron, tree, and mekon, poppy.)

1. **D. rigida** Benth. BUSH-POPPY. Shrub 5.7 to 20 dm. high, the main trunk with very shreddy bark; leaves ovate- to linear-lanceolate, borne on short petioles which, by a twist, bring the blade vertical; flowers 2.4 to 6 cm. broad; pod curved, 4.8 to 9.6 cm. long.—Dry slopes and ridges at middle altitudes.

4. **ARGEMONE** L. PRICKLY POPPY

Annual herbs with acrid orange juice and prickly sinuate or pinnatifid leaves. Flowers erect in the bud. Sepals 2 (often 3) with a horn-like appendage below apex. Petals 4 (or 6). (Greek name of some herb, transferred here.)

1. **A. platyceras** Link & Otto. Robust, 4 to 11.5 dm. high, very spiny; petals white; capsule-valves crested or spiny.—S. Cal. Var. **HISPIDA** Prain. Chicalote. Whole plant densely setose-hispid as well as armed with stouter yellow spines.—Mountain valleys or cañon flats.

5. **PAPAVER** L. POPPY

Herbs with the leaves pinnately cleft, lobed or divided. Flowers solitary on long stalks. Sepals 2. Petals 4. Stamens many. Pod sub-globose or obovoid, with 4 to many intruded placentae. (Latin name of the poppy.)

Juice milky; stigmas sessile, radiating upon the summit of the ovary.....
1. *P. californicum*.
Juice yellow; stigmas capitate upon a short slender style.....2. *P. heterophyllum*.

1. **P. californicum** Gray. WESTERN POPPY. Plants 4.3 to 6 dm. high; leaves pinnately divided, the segments oblong or roundish, lobed, toothed or entire; petals red with a green spot at base; pod turbinate-obovate.—Hill country, cismontane S. Cal.; n. to Marin Co.

2. **P. heterophyllum** (Benth.) Greene. WIND POPPY. Plants 4.3 to 5.7 dm. high; leaves pinnate or pinnately cleft, the segments varying from oval to linear, and variously cleft or entire; petals broadly obovate with wedge-shaped base, brick-red with a dark spot at base, 1.2 to 2.4 cm. long; pod clavate-obovate.—Hills and fields.

6. **ESCHSCHOLTZIA** Cham.

Herbs with ternately dissected mostly basal leaves and yellow flowers on long peduncles. Receptacle excavated or hollowed, forming a top-shaped dilation about the base of the pistil. Petals 4. Stamens numerous. Pod 2-valved. (Dr. J. F. Eschscholtz, college friend of Adelbert von Chamisso, German poet and naturalist, and his companion on Kotzebue's scientific voyage around the world.)

Perennial; flowers large; receptacle (torus) with a collar-like rim. 1. *E. californica*. Annual; flowers smaller; receptacle (torus) without rim or nearly so.

Seeds strongly muricate, i.e. bur-like; leaf divisions rather few. 2. *E. lobbii*.

Seeds not muricate; leaf divisions numerous. 3. *E. caespitosa*.

1. **E. californica** Cham. CALIFORNIA POPPY. Erect or diffuse, the stems 1.4 to 5.7 dm. long; flowers commonly on long stalks; petals fan-shaped, 1.2 to 4.8 cm. long, deep orange to straw-color; spreading rim of the receptacle conspicuous in the spring flowering, reduced in the summer and autumn.—Valleys and low hills everywhere.

2. **E. lobbii** Greene. FRYING PANS. Scapose, 9.6 to 19 cm. high, the leaves in a basal tuft; petals light yellow, 6 to 12 mm. long; seeds strongly muricate with flattened processes.—Sterile gravelly or clay foothills and rolling valley plains of the Great Valley.

3. **E. caespitosa** Benth. Stems mostly slender; flower-stalks 7 to 19 cm. long, much exceeding the leaves; receptacle short-tubular, without spreading rim; petals 1.2 to 2.4 cm. long; seeds reticulate.—Cañon sides.

FUMARIACEAE. FUMITORY FAMILY

Ours glabrous perennial herbs with alternate compound dissected leaves. Flowers perfect, irregular. Sepals 2, small and scale-like. Petals 4, in 2 dissimilar pairs, the outer large, inner pair narrower, carinate or crested on the back, cohering by the callous apex and covering the anthers and stigma. Stamens in 2 sets of 3 each, placed opposite the outer petals, the filaments of each set usually united. Ovary superior. Capsule 1-celled.—Species about 225, all continents except Australia and Africa.

1. **DICENTRA** Bernh.

Flowers in panicles or racemes or solitary. Corolla flattened, cordate at base. (Greek *dis*, twice and *kentron*, a spur, some species 2-spurred.)

1. **D. chrysantha** (H. & A.) Walp. GOLDEN EAR-DROPS. Stems stiff, coarse, leafy, 6 to 15 dm. high; leaves bipinnate, the division cleft into narrow lobes; flowers yellow, erect, in a large racemose panicle; petals distinct, 1.2 to 1.4 cm. long.—High dry ridges, inner ranges.

2. **D. formosa** (Andr.) DC. BLEEDING HEART. Stems naked, scape-like, 2 to 4.5 dm. high; leaves biternately compound, the divisions incisely cleft or pinnatifid; flowers rose-purple, nodding, borne in racemes; petals united to above the middle, 1.4 to 1.8 cm. long.—Shady woods.

CRUCIFERAE. MUSTARD FAMILY

Herbs with pungent juice and alternate leaves. Flowers in terminal leafless racemes, 4 sepals, 4 petals, 6 stamens (4 long and 2 short, or sometimes only 4 or 2). Pod 2-celled by a thin partition and splitting open by valves from the base. Some genera have a 1-celled pod which does not split open.—This family, which comprises about 1600 species, occurs in cold and temperate regions of all continents. The herbage is characterized by a pungent juice, antiscorbutic in its properties, which is present in some degree in every member of this family. Its presence is a more infallible mark of the family than any structural character.

A. *Pods elongated or linear.*

- Filaments with 1 or 2 pairs united; sepals strongly saccate at base, making a somewhat flask-shaped flower.....1. STREPTANTHUS.
 Filaments all distinct.
 Pods somewhat corky, not splitting lengthwise.....4. RAPHANUS.
 Pods splitting lengthwise, the 2 valves falling away and leaving the partition.
 Pods pointed with a long beak prolonged much beyond the valves; flowers large, yellow.....5. BRASSICA.
 Pods not beaked.
 Stems from annual roots or perennial root-crowns.
 Valves of the pod nerved.
 Pod valves more or less distinctly 3-nerved; leaves pinnatifid or pinnately dissected; flowers yellow; pods terete....
 3. SISYMBRIUM.
 Pod valves 1-nerved.
 Seeds commonly in 1 row in each cell (but see no. 8).
 Leaves pinnatifid (at least the lower); flowers small.
 Flowers yellow; pods somewhat quadrangular, pointed; perennial.....6. BARBAREA.
 Flowers white or yellowish; pods terete; ours annuals or perennials.....
 2. THELYPODIUM.
 Leaves commonly entire or toothed.
 Flowers orange or yellow.....7. ERYSIMUM.
 Flowers white or whitish or purple..8. ARABIS.
 Seeds in 2 rows in each cell; plants of wet places.....
 11. RADICULA.
 Valves of the pods not nerved; flowers white; leaves pinnate.....
 9. CARDAMINE.
 Stems from tuberous rootstocks; some of the leaves 3-foliolate.....
 10. DENTARIA.

B. *Pods very short, nearly or quite as broad as long.*

- Pods splitting open by valves.
 Pods flattened parallel to the broad partition; flowers white or yellowish.....
 12. ALYSSUM.
 Pods flattened contrary to the narrow partition.
 Pods obcordate or elliptical, several-seeded.....13. CAPSELLA.
 Pods roundish or ovate, notched or winged at summit, 2-seeded.....
 14. LEPIDIUM.
 Pods not splitting open, bordered by a wing.....15. THYSANOCARPUS.
 1. STREPTANTHUS Nutt.

Ours annuals, the basal leaves toothed or pinnatifid, those of the stem similar or entire, often clasping by a sagittate base. Flowers in terminal racemes. Sepals usually of the same color as the petals, strongly saccate at base and contracted above, the flower thus becoming somewhat flask-

shaped. Petals purple or white, with a narrow crisped blade. Longer pairs of stamens with filaments more or less united. Pod narrowly linear. (Greek streptas, twisted, and anthos, flower, in reference to the petals.)

1. **S. glandulosus** Hook. JEWEL FLOWER. Simple or branching, 2.8 to 5.7 dm. high; flowers nearly or quite 1.2 cm. long; sepals deep purple; petals purple, or white and purple; pods 4.8 to 7.2 cm. long, 2 mm. wide.—Hill and mountain sides.

2. THELYPODIUM Endl.

Coarse erect annuals or biennials. Basal leaves mostly petioled, those of the stem petioled or sessile-auriculate. Flowers white or pale yellow, rarely roseate, in often dense racemes. Petals with narrow claw and narrow or obovate limb. Pod terete, slender. (Greek thelus, female, and pus, foot or support, the ovary more or less stipitate.)

1. **T. lasiophyllum** Greene. Stem simple or branching above, 2.8 to 14 dm. high; herbage hispid or nearly glabrous; lower leaves pinnatifid, upper lanceolate, less lobed; flowers 3 to 4 mm. long; pods 4.8 to 9.6 cm. long, strictly deflexed or divaricate-spreading.—Open foothills, coastal S. Cal. and Coast Ranges.

3. SISYMBRIUM L.

Erect annuals with pinnatifid or finely dissected leaves (the base not clasping or auriculate). Flowers very small (1.5 to 2 mm. long), yellow. Sepals oblong or linear, equaling or exceeding the claws of the petals. Pod linear or oblong, terete or nearly so, more or less distinctly 3-nerved. (Greek sisumbrion, the ancient name for some plant of this family.)

Pods subulate, closely appressed; seeds in 1 row.....1. *S. officinale*.
Pods oblong to linear, spreading; seeds in 2 rows.....2. *S. pinnatum*.

1. **S. officinale** (L.) Scop. HEDGE MUSTARD. Roughish with short stiff hairs; stem erect, with widely diverging branches above, 5 to 11.5 dm. high; leaves lyrate-pinnatifid or pinnate, the segments dentate or coarsely toothed; pods 1.2 cm. long, tapering to summit, closely appressed to the axis of the raceme.—Naturalized weed, introduced from Europe.

2. **S. pinnatum** (Walt.) Greene. TANSY MUSTARD. Stem 2.2 to 5.7 dm. high; herbage finely ashy-tomentose; leaves pinnately or bipinnately dissected into thinnish and delicate small segments; petals 2 mm. long; pods oblong to linear, acute at each end, 6 to 12 mm. long, borne on spreading pedicels of equal or greater length.—Open country, coastal S. Cal. and e. and ne.

4. RAPHANUS L. RADISH

Coarse much-branched herbs with lyrate-pinnate or pinnatifid leaves or the uppermost merely toothed. Flowers large, purple, yellow, or white. Pod thick, beaked by the stout style, 1-celled, filled with spongy tissue, more or less constricted between the seeds and at last breaking into 1-seeded joints. (Greek raphanos, quick-appearing, on account of the prompt germination of the seeds.)

1. **R. sativus** L. RADISH. Plants 8 to 20 dm. high; flowers about 16 mm. broad.—Cult. from Eur., now naturalized in waste places.

5. BRASSICA L. MUSTARD

Annuals with lyrate-pinnatifid or pinnate leaves (the upper disposed

to be entire) and yellow flowers. Petals with long claw and abruptly spreading blade, 4 greenish glands alternating with the claws of the petals. Pod terete, ending in a stout beak. (The Latin name for cabbage.)

Pods ascending on spreading pedicels.

Stem leaves auriculate or cordate-clasping; beak terete.

Leaves from the first more or less fleshy; flowers creamy yellow.

Leaves glabrous from the first.....1. *B. oleracea*.

First leaves hairy.....2. *B. campestris*.

Leaves thin and green; flowers bright yellow; root tuberous....3. *B. rapa*.

Stem leaves petioled or merely sessile; beak flattish.....4. *B. arvensis*.

Pods closely appressed to the stem.

Stems glabrous or nearly so; pods somewhat quadrangular.....5. *B. nigra*.

Stems retrorse-hispidulose; pods terete.....6. *B. adpressa*.

1. ***B. oleracea*** L. CABBAGE. Leaves from the first more or less fleshy and glaucous-blue; flowers large, 8 to 24 mm. long; pods large, long-beaked.—Native of Eur. Var. CAULO-RAPA DC. Kohlrabi. Stems tuberous above the roots, the tuber bearing the leaves.—Cult. Var. GEMMIFERA DC. Brussels Sprouts. Stem tall, erect, the axillary buds developed into little heads.—Cult. Var. ACEPHALA DC. Kale. Leaves thick, tender, loose, not packed into heads.—Cult. Var. CAPITATA L. Garden Cabbage. Main axis short and thick, the leaves densely packed into a gigantic bud or head; leaves plane, not blistered.—Cult. Var. BULLATA DC. Savoy Cabbage. Leaves packed into a head, blistered or puckered.—Cult. Var. BOTRYTIS L. Cauliflower. Flower-cluster condensed and thickened, forming a head.—Cult.

2. ***B. campestris*** L. "COMMON YELLOW MUSTARD". Stem sparingly branched, 6 to 17 dm. high; herbage glaucous; basal leaves petioled; upper leaves all sessile and clasping by an auricled base; flowers 6 to 8 mm. long; pods 3 to 3.6 cm. long, borne on spreading pedicels.—Cultivated fields, nat. from Eur. Var. NAPO-BRASSICA DC. Rutabaga. Root tuberous.—Cult.

3. ***B. rapa*** L. TURNIP. Leaves hairy, lyrate or interrupted below; flowers small; petals deciduous.—Cult. from Eur.

4. ***B. arvensis*** (L.) B.S.P. CHARLOCK. Stem 2.8 to 5.7 dm. high; herbage light green; leaves petioled or sessile by a narrow base, not clasping; pods ascending or erect, 2.4 to 3.6 cm. long.—Sparingly nat. from Eur.

5. ***B. nigra*** (L.) Koch. BLACK MUSTARD. Stem 8.5 to 17 or 34. dm. high; herbage dark green; leaves all petioled; uppermost often linear, entire and hanging; petals 7 mm. long; pods 1.2 to 1.8 cm. long.—Cultivated fields, nat. from Eur. It is a serious pest in grain fields. Even in uncultivated lands it may become so tall as to overtop both horse and rider, thus verifying the description in Matthew 4:31-32, it "shooteth out great branches so that the fowl of the air may lodge under the shadow of it." (Matthew is a book in the Bible.) The seeds are medicinal and for this purpose *Brassica nigra* is cultivated as a crop plant in Santa Barbara Co.

6. ***B. adpressa*** Boiss. Stems 4.3 to 8.6 dm. high; herbage hispidulose; leaves pinnately parted or the uppermost subentire.—Along the coast and spreading into the interior; an offensive weed, nat. from Eur.

6 **BARBAREA** R. Br.

Perennial herbs with lyrate or pinnatifid leaves. Flowers yellow. Pod linear, somewhat quadrangular, the valves strongly 1-nerved. (Named after St. Barbara.)

1. **B. vulgaris** R. Br. WINTER CRESS. Stem erect, 2.4 to 3.8 dm. high; herbage glabrous; leaves with the terminal lobe largest and often oblong-lanceolate; petals about 6 mm. long; pods 3.6 cm. long.—Along streams in the hills or mountains.

7. **ERYSIMUM** L. WALL-FLOWER

Biennial or perennial herbs. Stem simple or with few branches. Leaves narrow, entire or toothed. Flowers orange to light yellow. Pod linear, flattened or 4-sided. (Greek name of a garden plant.)

Flowers orange; pods 4-sided; mountains.....1. *E. asperum*.
Flowers light yellow; pods flattened; coastal.....2. *E. capitatum*.

1. **E. asperum** DC. WESTERN WALL-FLOWER. Stem 3 to 7 dm. high, rather densely clothed below with leaves; herbage roughish-pubescent; lower leaves petioled, 7.2 to 14.4 cm. long, 4 to 12 mm. wide, the uppermost shorter; flowers 1.6 to 2 cm. broad; blade of petals broadly elliptic; pods 7.2 to 9.6 cm. long, 2 mm. wide.—Rocky places in the hills and mountains. The root was used medicinally by the native tribes.

2. **E. capitatum** (Dougl.) Greene. COAST WALL-FLOWER. Stem 1.4 to 4.3 dm. high, finely pubescent; flowers cream-color to yellowish, rarely white, at first in a head-like cluster, the axis in fruit elongating and becoming a short raceme; pods 3.6 to 6 cm. long, nearly 4 mm. broad.—Sandy lands along the coast.

8. **ARABIS** L. ROCK CRESS

Annuals, biennials or perennials. Flowers rose-purple, white or yellowish white. Petals with narrow claw and flat blade. Pod flattened parallel to the partition. Valves more or less 1-nerved. (Name from the land Arabia.)

1. **A. glabra** (L.) Bernh. TOWER MUSTARD. Biennial; stem erect, simple, 4.7 to 11.5 dm. high; basal leaves broadly spatulate to narrow obovate, dentate, 3 to 10.8 cm. long; cauline leaves ovate to lanceolate, entire, clasping; flowers dull white; pods narrow, strictly erect, 7.2 to 9.6 cm. long.—Foothills and mountains.

9. **CARDAMINE** L. BITTER CRESS

Erect herbs with leafy stems. Leaves pinnate, the basal in a rosette. Flowers white or pinkish. Flowers smaller and pods narrower than in *Dentaria*. (Ancient Greek name of some species of cress.)

1. **C. oligosperma** Nutt. Stems 7 to 30 cm. high; leaves 1.2 to 3.6 cm. long, with 5 to 11 leaflets; petals much surpassing sepals; valves of pod separating while still green.—Openly wooded country, Coast Ranges from Monterey Co. n.

10. **DENTARIA** L. TOOTHWORT

Glabrous perennials. Stem and 1 or 2 long-petioled leaves from a tuberous rootstock, the stems rarely branched and sparingly leafy. Flowers white or rose-tinted, appearing in early spring. Petals with

slender claws and ovate limb. Sepals short. Pod linear, flattened. (Latin *dens*, a tooth, the rootstocks toothed in some species.)

1. **D. integrifolia** Nutt. MILKMAIDS. Stem stoutish, 2.8 dm. high; leaves thickish, those from the rootstock simple or 3-foliolate; stem leaves 3-foliolate; leaflets roundish to ovate or the upper lanceolate; flowers white, 1.2 cm. broad.—Valleys, especially in heavy or adobe soil.—Var. CALIFORNICA Jepson. Taller and more slender; leaves larger, thinnish, sometimes 5-foliolate; corolla white or pale rose-color.—Shady woods.

11. RADICULA Hill

Annuals or perennials, growing in water or wet places. Flowers small, white or yellow. Sepals spreading. Petals scarcely clawed. Pod linear or oblong, round or nearly so. Seeds minute, in 2 rows in each cell. (Diminutive of *radix*, radish.)

Leaves divided; stems diffuse or ascending.

Petals white, nearly twice as long as the calyx.....1. *R. nasturtium-aquaticum*.

Petals yellow, little longer than the calyx.....2. *R. curvisiliqua*.

Leaves undivided or only the lower pinnatifid; petal white, much longer than the calyx; stems erect.....3. *R. armoracia*.

1. **R. nasturtium-aquaticum** Britt. & Rendle. WATER CRESS. Stems ascending, prostrate at base and rooting at the nodes; herbage glabrous; leaflets or segments 3 to 9, ovate or roundish, the terminal one largest, or the lowest leaves simple; pods widely spreading, 1.2 to 2.4 cm. long, on pedicels about as long.—Springs and slow-flowing creeks; nat. from Eur. The young plants are used as salad.

2. **R. curvisiliqua** (Hook.) Greene. WESTERN YELLOW-CRESS. Stems diffuse, 7.2 to 16.8 cm. long; herbage sparsely hairy; leaves pinnatifid or pinnately parted into many broad or narrow segments which vary from entire to pinnatifid; pods linear, terete, more or less curved, 5 to 14 mm. long, borne on pedicels 1 to 3 mm. long.—Beds of flood streams and former vernal pools.

3. **R. armoracia** Robins. HORSE-RADISH. Stout perennial, 5 to 8.5 dm. high, from a deep hard root; basal leaves large, oblong, crenate or pinnatifid; stem leaves lanceolate or linear, entire or toothed; pods globular.—Cult. from Eur.; escaped in moist places and along water courses. The root furnishes a well-known condiment.

12. ALYSSUM L.

Low branching herbs with narrow leaves and white or yellowish flowers. Filaments with teeth or glands at base. Pods small, orbicular, with 1 or 2 seeds in each cell. (Greek *α*, without, *lyssa*, madness, in ancient times an antidote for hydrophobia.)

Pubescence consisting of stellate hairs; pods narrowly margined, slightly emarginate above.....1. *A. alyssoides*.

Pubescence consisting of simple appressed hairs; pods marginless, pointed.....2. *A. maritimum*.

1. **A. alyssoides** L. SMALL ALYSSUM. Annual; petals yellowish white, scarcely exceeding the sepals which persist about the base of the fruit.—Cult. in gardens and sometimes occurring as an escape; native of Eur.

2. **A. maritimum** (L.) Lam. SWEET ALYSSUM. Perennial; petals

white, twice as long as the deciduous sepals.—Cult. from Eur. in some places half-naturalized.

13. **CAPSELLA** Medic.

Slender annuals with pinnatifid leaves and small white flowers. Petals small, little exceeding the sepals. Pod inversely heart-shaped in ours, strongly flattened contrary to the partition. (Latin capsella, a little box.)

1. **C. bursa-pastoris** Moench. SHEPHERD'S PURSE. Stem simple or branching, 7 to 36 cm. high, sparsely hispid; basal leaves in a spreading rosette, all the lower petioled, the upper sessile by an auricled base; petals 2 mm. long or a little more; pods nearly or quite 6 mm. broad.—Nat. from Eur. in or about cult. places.

14. **LEPIDIUM** L. PEPPER-GRASS

Small annuals with toothed or pinnatifid leaves and small white or greenish flowers. Pod roundish, much flattened contrary to the narrow partition, notched or with two wings at apex. Greek lepidion, a little scale, in reference to the flattened pods.)

1. **L. nitidum** Nutt. TONGUE-GRASS. Simple or branching from the base, 2.4 to 24 cm. high; leaves 2.4 to 9.6 cm. long, the lower pinnatifid, the upper entire; pedicels flattened; petals none.—Low hills and valleys in early spring.

2. **L. bipinnatifidum** Desv. WAYSIDE PEPPER-GRASS. Plants often closely matting the ground, sometimes merely diffuse; leaves pinnatifid or bipinnatifid; racemes numerous, dense and narrow; pedicels very short; petals none.—Hard beaten soil of paths and roads.

15. **THYSANOCARPUS** Hook.

Slender erect annuals with mostly simple stems and minute white or purplish flowers. Sepals ovate, spreading. Petals spatulate. Ovary 1-celled and 1-ovuled, becoming in fruit a pod with a broad circular wing, the wing with small holes or radiating nerves. (Greek thusanos, fringe, and karpos, fruit.)

Leaves oblong-lanceolate, the basal forming a rosette, pinnatifid or toothed.....

1. *T. curvipes*.

Leaves linear to oblong-linear, the basal entire or with divaricate salient segments, not forming a rosette.....

2. *T. laciniatus*.

1. **T. curvipes** Hook. FRINGE-POD. Stem 3 to 5 dm. high; leaves lanceolate or linear, all except the basal sessile; pods obovate or roundish, hairy or glabrous, 3 to 7 mm. long; wing narrow, rather crowded with broad nerves; pedicels recurved.—Open hills. Var. **ELEGANS** Rob. Wing with large perforations between the rays.—Open hills.

2. **T. laciniatus** Nutt. Stems 1.9 to 3.6 dm. high; leaves linear, subentire or deeply pinnatifid; pods obovate, elliptic, or orbicular, reticulated, 2 to 4 mm. long; pedicel spreading and deflexed.—Open hills, S. Cal. Cattlemen believe that the herbage gives a taint to the flesh of range cattle.

CARYOPHYLLACEAE. PINK FAMILY

Herbs with commonly swollen nodes and simple entire opposite leaves. Calyx 5-toothed or of 5 distinct sepals. Petals 5. Stamens 5 or 10, rarely

fewer. Ovary superior, 1-celled (rarely 3-celled), the ovules on a central placenta. Styles 2 to 5. Fruit a pod opening by valves or teeth at the summit, or 1-seeded and indehiscent.—Species 1200 to 1500, all parts of the earth.

- Sepals united into a 5-toothed calyx; petals with long claws; stamens 10; stipules none.....1. *SILENE*.
 Sepals distinct or nearly so; petals without claws; stamens 10, 5, or fewer.
 Stipules none.
 Petals not entire.
 Petals retuse or bifid; styles 5.....2. *CERASTIUM*.
 Petals parted almost to base into 2 narrow segments; styles 3 or 4.....3. *STELLARIA*.
 Petals entire; styles 3.....4. *ARENARIA*.
 Stipules present, scarious; petals entire.
 Styles 3; leaves opposite.....5. *SPERGULARIA*.
 Styles 5; leaves apparently whorled.....6. *SPERGULA*.

1. **SILENE L. CATCH-FLY. CAMPION**

Herbage more or less viscid. Flowers mostly large and showy. Calyx tubular or inflated. Summit of claw of petals commonly furnished with a scale or appendage. Stamens 10. Styles 3, rarely 4. Pod opening by 3 or 6 teeth. (Greek sialon, saliva, the stem and other parts viscid.)

Annuals; flowers in a 1-sided raceme; petal blades more or less twisted.....1. *S. gallica*.

- Perennials; flowers in an open or narrow panicle; petal blades plane.
 Corolla crimson; petal claws not woolly; flowers in an open panicle.
 Corolla 2.4 to 3.6 cm. broad.....2. *S. californica*.
 Corolla 1.2 to 1.8 cm. broad.....3. *S. laciniata*.
 Corolla rose-color, 1.2 to 1.8 cm. broad; petals 2 cleft, the claws woolly; flowers in a spike-like panicle.....4. *S. verecunda*.

1. ***S. gallica* L. WINDMILL PINK.** Erect, simple or branched from the base, 2.4 to 3.6 dm. high; herbage hairy; leaves spatulate-obovate; flowers in a mostly 1-sided raceme; petals white or pink, entire; ovary almost completely 3-celled.—Very common weed nat. from Eur.

2. ***S. californica* Dur. INDIAN PINK.** Stems several from a deep tap-root, erect or half-erect or reclining amongst bushes, leafy, 1.5 to 10 dm. long; leaves elliptic-ovate to oblanceolate, more or less acuminate, 2.4 to 7 cm. long; corolla scarlet; petals cleft, the segments bifid and toothed, or the lateral small and entire; ovary sessile.—Cent. and n. Cal.

3. ***S. laciniata* Cav.** Stems 5.7 to 14 dm. high; leaves linear- to oblong-lanceolate, or sometimes oblanceolate; flowers bright scarlet; blade of petals 4-cleft, the lobes again cleft or the lateral reduced to small teeth; ovary on a stipe.—S. Cal. n. to Monterey Co.

4. ***S. verecunda* Wats.** Stems several from a thick taproot, 2.8 to 3.6 dm. high, leafy, especially at base; basal leaves oblong- or linear-lanceolate, petioled, the upper smaller, sessile or less distinctly petioled; petals rose-red, the blade cleft to the middle into entire or toothed lobes.—Cent. and S. Cal.

2. **CERASTIUM L. MOUSE-EAR CHICKWEED**

Pubescent herbs. Flowers white, in dichotomous cymes. Petals retuse or bifid. Stamens 10 or 5. Styles 5. Pod elongated, cylindric, often curved, usually exceeding the calyx, opening at summit by 10 teeth. (Greek keras, a horn, in allusion to the elongated curved capsules.)

Petals shorter than or about equaling the sepals.....1. *C. viscosum*.
 Petals twice as long as the sepals.....2. *C. arvense*.

1. **C. viscosum** L. MOUSE-EAR CHICKWEED. Erect annual 7.2 to 9.6 cm. high; leaves ovate to elliptic-oblong, slightly joined at base, 1.2 to 2.4 cm. long; petals oblong, bifid at apex, 4 mm. long; stamens 10 or only 5 with anthers; pod much exceeding the calyx.—Fields and roadsides, native of Eur.

2. **C. arvense** L. FIELD CHICKWEED. Perennial; stems several, 1.2 to 2.1 dm. long; leaves linear, acute, 2.4 to 3.6 cm. long, the lowermost but half as long; petals deeply notched; pod scarcely exceeding calyx.—Near the coast, San Francisco and n.

3. STELLARIA L. CHICKWEED

Low herbs. Flowers white, small. Petals 5, parted almost to the base into 2 narrow segments. Stamens 3 to 10. Styles 3 or 4. Pod ovoid or oblong, opening from the apex by as many or twice as many valves as there are styles. (Latin stella, a star, the flowers star-shaped.)

1. **S. media** Cyrill. COMMON CHICKWEED. Stems slightly succulent, weak and procumbent; lower leaves ovate, acute, petioled, the upper narrower, sessile; pedicels slender, turned downward in fruit; bracts foliaceous; petals shorter than the sepals; stamens 10, 5, or 3.—Half-shady places, common naturalized weed from Asia.

2. **S. nitens** Nutt. SLENDER CHICKWEED. Stems erect, filiform, branching above, 7 to 17 cm. high; leaves linear, acute, sessile, 4 to 14 mm. long, or the lowest ovate, 2 to 6 mm. long, abruptly contracted into slender petioles nearly twice as long; bracts scarious; petals half as long as the sepals, sometimes none.—Grassy hillsides and plains.

4. ARENARIA L. SANDWORT

Low branching annuals or tufted or prostrate perennials. Leaves mostly lanceolate or subulate, sessile, often rigid. Flowers white. Petals entire. Stamens 10. Styles 3. Pod globose or short oblong, opening by 3 entire or cleft valves. (Latin arena, sand, in which many species grow.)

1. **A. californica** Brew. Glabrous delicate annual 2.4 to 9.5 cm. high, diffusely branching from the base; leaves lanceolate, rather broad at base, slightly fleshy, 2 to 4 mm. long; petals oblong, 1½ times as long as the sepals.—Gravelly hill slopes or disintegrating rock outcroppings.

2. **A. douglasii** Fenzl. Annual; stems much branched, 4.8 to 14.5 cm. high; herbage glabrous or viscid-glandular; leaves filiform, 8 to 10 mm. long; petals obovate, 4 mm. long, exceeding the narrow sepals.—Sterile hillside soils.

5. SPERGULARIA J. & C. Presl. SAND SPURREY

Low herbs. Leaves linear or subulate-filiform, semi-terete, with scarious stipules. Sepals 5. Petals 5, white, pink or reddish, entire. Stamens commonly 10. Styles 3, rarely 5. Pod 3-valved. Seeds often wing-margined. (Derivative of Spergula.)

Perennials.

Erect or ascending, more or less succulent, with fleshy fusiform roots.....
 1. *S. macrotheca*.

Prostrate, not obviously succulent; roots fibrous, not fleshy.

Stems long and somewhat straggling, from a matted or tufted center, flowering from the middle to the end of the branches..2. *S. rubra*.

Plants matted; flowering mostly at end of branches.....3. *S. clevelandi*.
 Annuals; quite erect or ascending.....4. *S. salina*.

1. ***S. macrotheca*** (Hornem.) Heynh. Stems several, erect or ascending; herbage deep green and often viscid-pubescent; leaves narrowly linear, 2.4 to 3.6 cm. long; petals 6 to 8 mm. long, pink.—Sandy borders of salt marshes. Var. *LEUCANTHA* Jepson. Mostly glabrous; flowers white.—Alkaline plains of the interior. Var. *SCARIOSA* (Britt.) Rob. Herbage pale; internodes short.—Sea-bluffs.

2. ***S. rubra*** (L.) J. & C. Presl. var. ***perrennans*** Greene. Stems prostrate, long, slender and wiry, many from a matted or tufted center, branching little; leaves narrowly linear, 3 to 10 mm. long; stipules silvery-scarious, conspicuous; petals reddish, 4 mm. long, about equaling the sepals.—Beaten paths and old roadways; nat. from Eur.

3. ***S. clevelandi*** (Greene) Rob. Stems prostrate, forming deep green mats 12 to 31 cm. broad; herbage viscid-glandular; leaves filiform, conspicuously fascicled in the axils, all longer than the internodes; flowers in terminal cymes; corolla white, 6 to 8 mm. broad.—Sandy soil, San Francisco to San Diego.

4. ***S. salina*** J. & C. Presl. Mostly erect, branching, 7 to 19 cm. high; leaves narrowly linear, commonly shorter than the internodes; petals pink, 2 to 3 mm. long, shorter than the sepals; pod longer than the sepals.—Alkaline plains.

6. **SPERGULA** L. SPURRY

Diffusely branching annuals. Leaves narrowly linear or sub-terete, apparently in whorls but really opposite, several others of their own size being crowded in the axils. Stipules small and scarious. Petals white, entire. Stamens 10, occasionally 5. Styles 5. Pod 5-valved. (Latin *spargere*, to scatter, in reference to the dispersion of the seeds.)

1. ***S. arvensis*** L. CORN SPURRY. Stems 2.8 to 5.7 dm. long; hairs short, glandular; flowers in a cymose panicle with strongly divergent branches; corolla 8 mm. broad.—Fields and orchards; weed nat. from Eur.

AMARANTHACEAE. AMARANTH FAMILY

Ours coarse herbs with simple entire leaves. Flowers usually greenish, inconspicuous, perfect or unisexual, in ours congested in spikes or clusters. Corolla none. Stamens 5, sometimes fewer. Ovary superior, 1-celled, with 2 or 3 stigmas. Fruit a utricle.—About 550 species, mostly tropical, none in the cold zones.

1. **AMARANTHUS** L. AMARANTH

Annual weeds with alternate leaves. Flowers bracteate, usually monoecious or polygamous, rarely dioecious. Seed mostly black and shining. (Greek *a-*, not, and *maraino*, to fade, the spikes of certain species retaining their color in drying.)

Flowers in dense stout terminal and axillary spikes; sepals 5, mostly unequal.....

1. *A. retroflexus*.

Flowers in small axillary clusters of short spikes; sepals 3, subequal.....

2. *A. graecizans*.

1. ***A. retroflexus*** L. ROUGH PIGWEED. Stoutish, with erect or as-

ending branches, 3 to 11.5 dm. high; herbage roughish-pubescent; leaves petioled, 2.4 to 7.2 cm. long; utricle wrinkled, surpassed by the sepals.—Very common in orchards, gardens and waste lands; nat. from trop. Am.

2. **A. graecizans** L. TUMBLE-WEED. Bushy in outline, rigidly branched, 3 to 9 dm. high; herbage glabrous or nearly so; leaves 8 to 16 mm. long.—Summer weed; extremely abundant in cultivated fields; nat. from trop. Am. The plant becomes rigid when dead and dry, and, when loosened by fall winds, is carried across the field as a tumble-weed, the seeds being thus most effectively dispersed.

CHENOPODIACEAE. GOOSEFOOT FAMILY

Herbs or shrubs, often succulent or scurfy, leafy or leafless. Flowers small, perfect or unisexual. Calyx 5 (or 4)-lobed. Stamens commonly 5. Ovary superior, 1-celled, 1-ovuled. Styles or stigmas 2 or 3. Fruit an achene or utricle.—Species about 550, mostly of alkaline deserts or steppes or salt marshes.

Leaves never spiny; embryo annular or curved or folded.

Stems with foliaceous leaves.

Flowers perfect, all of one kind.

Calyx with a fleshy disk at base, the ovary partly sunk in it....1. **BETA**.

Calyx without disk, 5 (or 4)-parted, herbaceous or fleshy in fruit.....

2. **CHENOPODIUM**.

Flowers unisexual, of 2 kinds, the staminate with calyx, the pistillate without calyx and enclosed by 2 appressed bracts.....3. **ATRIPLEX**.

Stems fleshy, jointed, with the leaves reduced to mere scales; flowers perfect or unisexual.....4. **SALICORNIA**.

Leaves dry, rigid or spiny; flowers perfect; embryo spirally coiled....5. **SALSOLA**.

1. **BETA** L.

Glabrous biennial herbs. Roots fleshy. Leaves alternate, the lower long-petioled. Flowers in sessile axillary clusters, the clusters in paniced spikes. Stamens 5. Styles 2 or 3. (Perhaps Celtic bett, red, on account of the color of the root.)

1. **B. vulgaris** L. BEET. Stems 5.8 to 17 dm. high; root conical; lower leaves 9.6 to 24 cm. long, oblong or ovate, the upper smaller.—Garden plant, native of Eur.; also naturalized in marshes. Var. **CRASSA** Alef. Sugar Beet. Roots very thick, sugar-producing.—Cult. crop plant. Var. **CRUENTA** Alef. Leaves large and showily colored.—Used for garden bedding. Var. **CICLA** Moq. Chard. Leaf Beet. Spinach Beet. Leaves thick-ribbed.—Used as a pot-herb.

2. **CHENOPODIUM** L. GOOSEFOOT. PIGWEED

Annual or perennial herbs often white-mealy or glandular. Leaves alternate, petioled. Flowers greenish, sessile, clustered. Stamens 5 or fewer. Ovary depressed. Styles 2, rarely 3 or 4, slender. (Greek chen, goose, and pous, foot, on account of the shape of the leaves.)

Annual; calyx deeply parted into lobes or segments.

Herbage finely mealy, at least not pubescent or glandular; achene with the pericarp closely persistent on the seed.

Erect; herbage light green.....1. *C. album*.

Diffuse; herbage dark green.....2. *C. murale*.

Herbage glandular-pubescent and aromatic, but not mealy; flower clusters spicate or paniculate.

Leaves slender-petioled; achene imperfectly enclosed by calyx; spikes cymose-diverging, leafless3. *C. botrys*.

Leaves slightly petioled; achene perfectly enclosed by calyx.....
4. *C. ambrosioides*.

Perennial; calyx merely toothed or cleft, more distinctly synsepalous; achene exserted; spike terminal, leafless or leafy only below....5. *C. californicum*.

1. ***C. album*** L. WHITE GOOSEFOOT. PIGWEED. Stems 5.8 to 11.5 dm. high; leaves rhombic-ovate, 2.4 to 4.8 cm. long; flowers clustered in close spikes; calyx in fruit about 1.5 mm. wide.—Common European weed in old fields. Also known as Lambs Quarters, the herbage making excellent boiled greens when taken young. Var. VIRIDE. Moq. Leaves bright green on both sides, or only slightly mealy beneath; inflorescence less dense.—Not so common.

2. ***C. murale*** L. SOWBANE. NETTLE-LEAF GOOSEFOOT. Stout and succulent, the loose branches 2 to 3.6 dm. long; leaves rhombic-ovate, 2.4 to 4.2 cm. long; flowers in dense axillary or terminal spicate panicles; panicles leafless or nearly so.—Nat. from Eur.; a common weed in waste places, winter flowering.

3. ***C. botrys*** L. JERUSALEM OAK. Erect, often widely branching, 1.4 to 5.8 dm. high; leaves ovate to oblong, 1.2 to 3.6 cm. long.—Waste places near dwellings and in flood stream beds; nat. from Eur.

4. ***C. ambrosioides*** L. MEXICAN TEA. Erect, 5.8 to 10 dm. high; leaves oblong or lanceolate, 4.8 to 12 cm. long; flowers in axillary clusters, forming a dense leafy spike; styles 3, sometimes 4.—Abundant along interior streams and near salt marshes. Nat. from trop. Am.; mostly autumnal. Var. ANTHELMINTICUM Gray. Wormseed. Spikes more elongated, leafless, —With the species. The seeds are used as an anthelmintic.

5. ***C. californicum*** Wats. SOAP PLANT. Stout, erect or decumbent at base, 4.3 to 7 dm. high; root large, carrot-like; leaves broadly triangular, 3.6 to 8.4 cm. long.—Stream beds and moist slopes or swales in open foothills. The root is grated on a rock by the native tribes and used as a soap.

3. ATRIPLEX L. SALT BUSH

Herbs or shrubs, usually mealy or scurfy. Flowers monoecious or dioecious. Styles 2. Bracts either free or united, much enlarged in fruit. (The ancient Latin name.)

Annuals; somewhat succulent and mealy; leaves petioled.

Leaves mostly lanceolate; fruiting bracts 8 to 12 mm. long.....1. *A. patula*.

Leaves triangular-hastate or deltoid; fruiting bracts 3 to 4 mm. long.....
2. *A. hastata*.

Perennials; not succulent, commonly white-scurfy; fruiting bracts red.....
3. *A. semibaccata*.

1. ***A. patula*** L. SPEAR ORACHE. Stout, erect, 2.4 to 4.3 dm. high; inflorescence more or less leafy at base.—Common in salt marshes along the coast.

2. ***A. hastata*** L. FAT-HEN. Rather slender, with ascending branches 3 to 7 dm. long; leaves 2.4 to 4.8 cm. long; flowers in dense terminal and lateral spikes 2.4 to 9.6 cm. long.—Common in salt marshes near the coast.

3. **A. semibaccata** R. Br. AUSTRALIAN SALT BUSH. Diffusely spreading, the stems 5.8 to 8.6 dm. long, woody below; leaves oblong, 1.2 to 4.8 cm. long; fruiting bracts rhomboidal, acute, 4 to 6 mm. long.—Cult. from Austr. as a forage plant and becoming spontaneous.

4. **SALICORNIA** L. SAMPHIRE. GLASSWORT

Low succulent herbs with opposite terete branches. Flowers in opposite clusters of 3, forming a cylindrical spike. Stamens 2, exerted in flower. Ovary oblong; styles 2 or 3, short. (Latin sal, salt, and cornu, horn, plants of saline habitat with horn-like branches.)

1. **S. ambigua** Michx. PICKLE-WEED. Stems erect, or decumbent and rooting at the joints, 1 to 3 dm. long; spike slender, about 3 mm. thick, all the scales flower-bearing to the top.—Salt marshes along the coast.

5. **SALSOLA** L.

Bushy-branching herbs. Flowers sessile and axillary, each subtended by 3 spinescent organs (a bract and 2 bractlets). Stamens 5. Styles 2. (Diminutive of Latin salsus, salty, most of the species of saline habitats.)

1. **S. kali** L. var. **tenuifolia** G. F. N. Mey. RUSSIAN THISTLE. Bushy annual, 3 to 11.5 dm. high; young leaves prickly-tipped; branches flowering from near the base; bracts ovate, prickly pointed.—Obnoxious farm weed, native of Asia.

NYCTAGINACEAE. FOUR-O'CLOCK FAMILY

Succulent herbs with opposite entire leaves and swollen joints. Flowers delicate. Involucre subtending 1 to many flowers, its bracts distinct or united and calyx-like. Corolla none. Calyx tubular, corolla-like, 4 to 5-lobed, its base hardening over the 1-celled 1-seeded superior ovary, forming a pericarp-like covering to the achene. Stamens commonly 5.—Species 160, mostly tropical, especially in the New World.

Involucre of distinct bracts; fruit usually winged.....1. **ABRONIA**.
Involucre calyx-like, 5-toothed; fruit not winged.....2. **MIRABILIS**.

1. **ABRONIA** Juss.

Peduncles axillary or terminal, bearing a many-flowered head subtended by 5 to 15 distinct involucre bracts. Calyx salverform. Calyx-base 3 to 5-winged. (Greek abros, graceful.)

1. **A. latifolia** Esch. YELLOW SAND-VERBENA. Stems stout, prostrate; leaves ovate to roundish, truncate or kidney-shaped at base; calyx yellow, 1.2 cm. long; fruit very large, its wings thick, the central cavity extending through them.—Seashore sands.

2. **A. umbellata** Lam. PURPLE SAND-VERBENA. Stems slender, prostrate; leaves roundish-ovate to oblong; calyx rose-purple, 1.2 to 1.6 dm. long; lobes 5, emarginate; wings of the smaller fruit thin but solid.—Seashore sands.

2. **MIRABILIS** L. FOUR-O'CLOCK

Involucre calyx-like, 5-cleft or -parted, 1 to several-flowered. Calyx reddish purple, tubular or funnelform with spreading limb. Stamens united at base. Fruit smooth or obscurely ridged. (Latin mirabilis, wonderful.)

1. **M. multiflora** Gray. Diffuse plants 7.2 to 14.4 cm. high; leaves

ovate or ovate-lanceolate; involucre 3 to several-flowered; calyx about 2.4 cm. long.—S. Cal.

2. *M. laevis* (Benth.) Curran. WISHBONE BUSH. Stems ascending; leaves round-ovate to cordate; involucre 1 to 3-flowered; calyx about 1 cm. long.—S. Cal.

AIZOACEAE. CARPET-WEED FAMILY

Ours prostrate or decumbent herbs. Flowers perfect and regular, solitary or clustered.—Species about 450, all continents.

1. **MESEMBRYANTHEMUM** L. FIG MARIGOLD. ICE-PLANT

Our herbs. Stems and leaves very succulent. Flowers axillary and terminal. Calyx-tube adnate to the ovary. Petals linear, numerous, inserted with the numerous stamens on the tube of the calyx. (Greek mesembria, mid-day, and anthemion, blossom.)

1. *M. aequilaterale* Haw. SEA FIG. Stems 1 to 2 m. long, the plants forming extensive mats; leaves 3-sided, 3.6 to 4.8 cm. long; flowers fragrant and showy; petals bright rose-purple.—Dunes and cliffs near the sea.

PORTULACACEAE. PURSLANE FAMILY

Low herbs with more or less fleshy entire leaves and regular flowers. Sepals 2. Petals commonly 5. Stamens 3 to 20. Ovary superior, 1-celled. Style-branches commonly 3. Fruit a capsule, 3-valved or opening by a lid.—About 150 species in the warmer dry and arid regions.

Capsule 2 or 3-valved.

Style 1, stigmas 2; sepals plane.....1. CALYPTRIDIMUM.

Style branches 3; sepals more or less concave.

Flowers in leafy racemes; petals commonly red, showy; stamens mostly 5 or more; seeds numerous.....2. CALANDRINIA.

Flowers in naked or bracteate racemes; petals white or pinkish; stamens 5 (or 3); seeds few (3 to 6).....3. MONTIA.

Capsule circumscissile.

Sepals 2 to 8, distinct and free from the ovary, persistent.....4. LEWISIA.

Sepals 2, united below and partly adherent to the ovary, the free upper portion deciduous5. PORTULACA.

1. **CALYPTRIDIMUM** Nutt.

Herbs with alternate or basal leaves and small flowers in panicles or in solitary or clustered scorpioid spikes. Stamens 1, 2 or 3. Seeds few to many. (Greek kaluptra, a calyptra, the petals closing over each other and carried up on the capsule.)

1. *C. umbellatum* (Torr.) Greene. PUSSY PAWS. Stems several, scape-like, 7 to 36 cm. high, arising from a dense rosette of spatulate leaves; cauline leaves few and similar or none; spikes in a terminal umbel or whorl; petals enfolding the 3 stamens, the fourth stamen enfolding the style.—Fine gravelly or sandy soil, open places in the mountains.

2. **CALANDRINIA** H. B. K.

Low fleshy annuals with alternate leaves. Flowers red (rarely white), lasting but one day. Stamens 7 to 13, rarely fewer. Seeds numerous, black and shining. (J. L. Calandrini, Swiss botanist.)

1. **C. caulescens** H. B. K. var. **menziesii** Gray. RED MAIDS. KISSES. Branching from the base, 4.8 to 43 cm. high; leaves narrowly oblanceolate or linear; petals roundish-obovate, notched at apex, 6 to 8 mm. long; pod enveloped by the persistent sepals.—Orchards, vineyards and open hills.

3. MONTIA L. INDIAN LETTUCE

Somewhat succulent very glabrous herbs with clustered stems and mostly basal leaves. Flowers white or pink, usually reopening the second or third day, borne in terminal racemes or umbels. Petals equal or somewhat unequal, distinct or slightly united at base, commonly emarginate at apex. Seeds 1 to 3. (Giuseppe Monti, Italian botanist, died 1760.)

Leaves basal or opposite.

Stems bearing 1 pair of leaves, these opposite.

Cauline pair of leaves quite distinct; pedicels 1.2 to 4.8 cm. long; perennial1. *M. sibirica*.

Cauline pair of leaves more or less united; annuals.

Cauline pair of leaves united into a disk; petals little longer than the sepals.....2. *M. perfoliata*.

Cauline pair of leaves not forming a disk, partially joined on one side; petals 3 times as long as the sepals....3. *M. spathulata*.

Stems bearing several pairs of opposite leaves; perennial by bulblets.....4. *M. chamissoi*.

Leaves alternate; perennial by stolons or bulblets.....5. *M. parvifolia*.

1. **M. sibirica** (L.) Howell. Stems 2.1 to 4.3 dm. high; basal leaves ovate on long petioles, the pair beneath the raceme ovate or almost round, distinct, sessile or rarely short-petioled; flowers on pedicels 2.4 to 6 cm. long; petals pink.—Swampy places along the coast.

2. **M. perfoliata** (Donn) Howell. MINER'S LETTUCE. Stems 7.2 to 34 cm. high; basal leaves long-petioled, the earliest linear, the later ones with ovate, rhomboidal or deltoid blade; pair beneath the raceme completely united into a round and entire or angulately lobed disk which is 1.2 to 9.6 cm. broad; petals white.—Shade of trees in openly wooded country in the hills or valleys.

3. **M. spathulata** Howell. Caespitose, 2.4 to 14 cm. high; herbage glaucous and very fleshy; leaves linear or lanceolate; cauline leaves partially joined on one side; petals white or light pink.—Open gravelly or rocky hilltops, Coast Ranges.

4. **M. chamissoi** Dur. & Jac. Stems ascending or decumbent, rooting at the lower nodes, 9.6 to 14 cm. long, the plants perennial by bulblets produced at the end of slender runners; leaves opposite, mostly narrowly oblong, 1.2 to 4.8 cm. long, petioled; racemes axillary; pedicels recurved after flowering; petals pink or white, 3 times as long as the sepals.—Wet places in the mountains.

5. **M. parvifolia** (Moc.) Greene. Stems very slender, almost whip-like, 1.2 to 2.6 dm. high, several from a *Sedum*-like rosette; leaves fleshy, the lowest ovate or rhombic, 1.2 cm. long, petioled, the upper few, small, narrow, and sessile; upper axils producing fleshy bulblets which fall away readily; racemes terminal; sepals 2 mm. long; petals rose-color varying to white, 6 to 10 mm. long.—Springs and wet places, coast from Monterey Co. n. and Sierra Nevada.

4. **LEWISIA** Pursh

Fleshy perennials with thick roots and 1 to many-flowered scapes, the leaves in a basal rosette. Flowers often large and handsome. Petals 5 to 16, varying from white to red. Stamens 5 to numerous. Seeds several to many. (Capt. Lewis of the Lewis & Clarke expedition across the continent, 1806-7, who collected the type species.)

1. **L. rediviva** Pursh. BITTER ROOT. Scapes 1.8 to 4.8 cm. high, jointed near the middle and bearing an involucrel whorl of 5 to 7 scarious bracts; leaves linear, thick; petals pink, rose, or white; stamens 40 to 47; filaments united at base.—Montane.

5. **PORTULACA** L.

Fleshy herbs with alternate leaves and yellow flowers. Calyx 2-cleft, the tube adnate to the ovary below. Petals 5, inserted with the stamens on the calyx. Stamens 7 to 20. Seeds many. (Old Latin name.)

1. **P. oleracea** L. COMMON PURSLANE. Stems 9 to 19 cm. long; herb-age glabrous; leaves cuneate or obovate; flowers sessile, opening only in sunshine; petals notched or 2-lobed.—Low lands.

FRANKENIACEAE. FRANKENIA FAMILY

Low perennial herbs or dwarf bushes, with opposite entire leaves and complete flowers. Ovary superior, 1-celled, with 2 to 4 parietal placenta, becoming a 2 to 4-valved pod.—Species about 34, all continents.

FRANKENIA L.

Leaves small, crowded in the axils. Flowers sessile, either solitary or by the reduction of the upper leaves becoming somewhat cymose. Calyx tubular, 4 or 5-toothed. Petals 4 or 5. Stamens 4 to 7, exserted. Style 3-cleft. (John Franke, Swedish professor at Upsala.)

1. **F. grandifolia** C. & S. ALKALI-HEATH. Erect or diffuse, 9.6 to 31 cm. high; leaves obovate to linear-oblongate, 6 to 12 mm. long; petals small, pinkish.—Seashore, salt marshes and (var. *campestris* Gray) on alkaline plains.

SALICACEAE. WILLOW FAMILY

Trees or shrubs, generally growing along streams, with alternate entire or merely toothed leaves and staminate and pistillate flowers in catkins on different plants, 1 flower to each bract. Stamens 2 to 80. Ovary 1-celled. Fruit a pod, containing numerous seeds with long silky down.—Species about 180, mostly in the north temperate and arctic zones.

Bracts of the catkin entire; stamens 1 to 9; buds with a single scale.....1. **SALIX**.
Bracts of the catkin cut-lobed at apex; stamens numerous; buds with many scales2. **POPULUS**.

1. **SALIX** L. WILLOW

Leaves mostly narrow, long-pointed, short-petioled. Catkins mostly erect, appearing before or with the leaves. Stigmas short. (Ancient Latin name of the willow.)

Filaments of the stamens woolly or hairy below.

Stamens 3 to 9; style short; stigmas roundish; trees, the trunk bark very rough.

- Petioles with wart-like glands at summit; stipules usually present.....
1. *S. lasiandra*.
- Petioles not glandular; stipules often absent.
Leaves broadly lanceolate, usually glaucous beneath....2. *S. laevigata*.
Leaves very narrow, nearly alike on both faces, often curving
towards apex.....3. *S. nigra*.
- Stamens 2; large shrubs, the trunk bark mostly smooth.
Stigmas linear, raised on a distinct style.....4. *S. sessilifolia*.
Stigmas roundish, oblong, sessile or nearly so.....5. *S. melanopsis*.
- Filaments of the stamens glabrous or mainly so; stamens 2; trunk bark smooth or
slightly roughened.
Style none; leaves obovate.....6. *S. scouleriana*.
Style conspicuous or at least evident.
Capsule silky or pubescent.....7. *S. sitchensis*.
Capsule essentially glabrous.....8. *S. lasiolepis*.

1. ***S. lasiandra*** Benth. YELLOW WILLOW. Tree 8 to 14 m. high; branchlets yellowish; leaves lanceolate, long-pointed, often pale or glaucous beneath; stipules broad, mostly conspicuous; catkins straight; stamens 5 to 9.—Coast Range streams.

2. ***S. laevigata*** Bebb. RED WILLOW. Tree 8 to 15 m. high; branchlets reddish; mature leaves lanceolate or oblong-lanceolate, green and shining above, pale or glaucous beneath; staminate catkins often flexuous; stamens 5 or 6.—Coast Range streams.

3. ***S. nigra*** Marsh var. ***vallicola*** Dudley. BLACK WILLOW. Tree 6 to 10 m. high; mature leaves lanceolate or linear-lanceolate, long-pointed, often somewhat sickle-shaped, green on both surfaces; stamens 3 to 5.—Great Valley to S. Cal.

4. ***S. sessilifolia*** Nutt. var. ***hindsiana*** And. SANDBAR WILLOW. Shrub 1.4 to 4 m. high; leaves linear, entire, thinly villous and green, or densely villous and silky; catkins slender.—Flood beds of streams. It is an important species in binding stream banks and levees against flood erosion.

5. ***S. melanopsis*** Nutt. var. ***bolanderiana*** Schn. LONGLEAF WILLOW. Shrub 1.4 to 4.3 m. high; leaves lanceolate or linear, remotely serrulate, mostly glabrous; catkin scales densely woolly.—Stream beds in valleys and foothills and into the mountains.

6. ***S. scouleriana*** Barr. NUTTALL WILLOW. Shrub or small tree 2 to 7 m. high; leaves broadly obovate or oblong-obovate, entire, yellow-green and lustrous above, yellow-veined, glabrate or densely short-silky beneath; catkins appearing before the leaves.—Hill slopes, low altitudes near the coast, 4000 to 10,000 ft. in the higher mountains.

7. ***S. sitchensis*** Sanson. VELVET WILLOW. Trees or shrubs 4 to 10 m. high; leaves oblong-ovate to oblanceolate, lustrous silky beneath, dark green and glabrous above, sometimes thick and leathery; pistillate catkins very slender, in flower 1.8 to 4.8 cm. long.—Stream banks near the coast.

8. ***S. lasiolepis*** Benth. ARROYO WILLOW. Trees or shrubs 3 to 5 m. high; trunk bark mostly smooth; mature leaves oblong, obscurely serrulate, dull green above, grayish beneath; catkins densely silky-tomentose, in flower 1.8 to 2.4 cm. long.—Rivers and creeks, and even along dry gulches in the hills.

2. **POPULUS** L. POPLAR

Leaves broad, ovate or roundish, long-petioled. Catkins pendulous,

appearing before the leaves. Stamens inserted on a concave, often oblique disk. Ovary borne in a cup-shaped disk. Stigmas 2 to 4, dilated or linear. (Classical Latin name of the poplar.)

1. *P. fremonti* Wats. COMMON COTTONWOOD. Trees 8 to 14 m. high with a broad crown; leaves deltoid or roundish, broader than long, yellowish-green, alike on both faces, the margin crenate except at the abruptly pointed apex and somewhat heart-shaped or truncate base; stamens 60 to 80.—Interior creeks and rivers. The wood is used by desert settlers for fencing, and is sometimes sawn into box shooK for fruit and other shipments.

2. *P. trichocarpa* T. & G. BLACK COTTONWOOD. Tree 5 to 8 m. high; leaves ovate, longer than broad, serrulate, dark green and shining above, rusty or silvery beneath; stamens 40 to 60.—Along streams.

POLYGONACEAE. BUCKWHEAT FAMILY

Herbs or somewhat woody plants with entire leaves. Stipules none or present in the form of sheaths above the swollen joints of the stem. Flowers small, often borne in an involucre. Calyx 3 to 6-cleft. Corolla none. Stamens 4 to 9. Ovary superior, 1-celled, becoming an achene which is commonly 3-angled.—About 700 species, mostly in the north temperate zone.

Leaves with sheathing stipules; involucre none.

Sepals 5, equal and erect in fruit.

Leaves elliptical to lanceolate or linear.....1. *POLYGONUM*.

Leaves triangular-cordate or sagittate.....2. *FAGOPYRUM*.

Sepals 6, unequal, the inner row erect and enlarging in fruit, the outer row reflexed in fruit.

Sepals of 2 kinds.....3. *RUMEX*.

Sepals all alike, withering-persistent under the 3-winged fruit..4. *RHEUM*.

Leaves without stipules; involucre present.

Involucre bract-like, 1-flowered, enlarged in fruit, 2-lobed, 2-saccate on back; leaves opposite, broad.....5. *PTEROSTEGIA*.

Involucre tubular or top-shaped; leaves alternate or in whorls, or mostly basal.

Involucre 5 to 6-toothed, the teeth spine-tipped, often hooked.....

6. *CHORIZANTHE*.

Involucre 3 to 8-toothed, the teeth not bristle-tipped.....7. *ERIGONUM*.

1. *POLYGONUM* L. KNOTWEED

Herbs with conspicuous stipules sheathing the prominent joints of the stem. Flowers white, red or greenish. Calyx 5-parted, often petal-like. Stamens 4 to 9. Styles 2 or 3. Achene triangular or lens-shaped. (Greek *polus*, many, and *gonu*, knee, on account of the nodose zigzag stem of many species.)

Leaves mostly broad or ample, not jointed to the petiole.

Spikes 1 or 2; flowers red; stamens 5, exserted.

Leaves elliptical or oblong; spikes 1.2 to 2.4 cm. long.....1. *P. amphibium*.

Leaves ovate-lanceolate; spikes 2.4 to 7.2 cm. long....2. *P. mühlenbergii*.

Spikes several to many; flowers greenish, white or flesh-color; stamens 6 to 8, included.

Sheaths naked in age; spikes often drooping; flowers white or flesh-color.....3. *P. lapathifolium*.

Sheaths truncate, fringed with bristles; spikes erect; flowers greenish.....

4. *P. acre*.

Leaves mostly narrow and lanceolate, jointed upon a short petiole.

Perennial and more or less suffrutescent; flowers crowded at ends of branches.....5. *P. paronychia*.

Annual, prostrate; flowers all along stem from the base.....6. *P. aviculare*.

1. **P. amphibium** L. WATER PERSICARIA. Aquatic perennial; leaves floating, elliptical to oblong or oblong-lanceolate; spike terminal, ovate or oblong, 1.2 to 2.4 cm. long; calyx red; stamens 5; style 2-cleft.—Ponds and slow-flowing streams.

2. **P. muhlenbergii** Wats. Perennial, aquatic or in half dry places; stems decumbent, 6 to 8.5 (or 17) dm. high; leaves thin; calyx rose-color or pink; style 2-cleft.—Lakes and sluggish streams.

3. **P. lapathifolium** L. COMMON KNOTWEED. Annual; stems stout, branching, 3 to 11.5 dm. high; leaves broadly lanceolate, attenuate or long-acuminate; sheathing stipules naked in age; racemes axillary and terminal, erect or nodding, 2.4 cm. long or more; calyx white or flesh-color; stamens 6; style 2 or 3-parted.—Borders of streams or in lowlands.

4. **P. acre** H. B. K. DOTTED SMARTWEED. Perennial, 5.8 to 14 dm. high; leaves lanceolate; sheathing stipules bristly ciliate; calyx greenish, conspicuously glandular; stamens 8; styles 2 or 3.—Low or marshy places.

5. **P. paronychia** C. & S. Stems 3 to 8.5 dm. long, clothed below with old sheaths; leaves linear-lanceolate; sepals white or rose-color; stamens 8, the three inner dilated at base.—Sand hills along the coast.

6. **P. aviculare** L. YARD GRASS. Annual; stems wiry, mostly prostrate, often 5 to 10 dm. long, flowering from the base; leaves oblong, acute; calyx-lobes white with a green center; stamens 8; styles 3.—Nat. from Eur., common in hard, often beaten, soils.

2. FAGOPYRUM Tourn.

Annual herbs, similar to Polygonum. Leaves triangular-cordate or sagittate. Flowers white, in corymbose panicles. Stamens 8, as many honey glands alternating with the filaments. Styles 3. Achene acutely triangular, large. (Greek fagus, beech, and pyren, grain, the fruits resembling a beech nut.)

1. **F. esculentum** Moench. CULTIVATED BUCKWHEAT. Cult. from northern Asia. The seeds are made into a flour which forms the basis of buckwheat cakes, one of the most delicious products of American cookery.

3. RUMEX L.

Coarse herbs with alternate and often large leaves. Flowers small, greenish or reddish, crowded and commonly whorled in paniced racemes. Sepals 6, the 3 outer spreading or reflexed in fruit, the 3 inner larger and somewhat colored, enlarging and closing over the nut-like fruit. Stamens 6. Styles 3. (Old Latin name used by Pliny.)

Flowers perfect or some staminate on the same plant; roots yellow, scented; pedicels jointed.

Inner fruiting sepals entire (or nearly so) and

Without callous grains; longer than broad.....1. *R. hymenosepalus*.

With callous grains.

Leaves strongly undulate; fruiting sepal with a broad wing bordering the callous grain.....2. *R. crispus*.

Leaves slightly undulate or plane.

- Leaves slightly undulate; fruiting sepals with a narrow wing bordering the callous grain.....3. *R. conglomeratus*.
 Leaves plane; fruiting sepals triangular, usually much larger than the callous grain.....4. *R. salicifolius*.
 Inner fruiting sepals with prominent slender teeth or bristles; callous grains 1 to 3.....5. *R. pulcher*.
 Flowers dioecious; roots red, scentless; pedicels not jointed..... 6. *R. acetosella*.

1. ***R. hymenosepalus*** Torr. CANAIGRE. Stem nearly simple, 3 to 5.8 dm. high; leaves oblong or tapering to each end, somewhat wavy-margined; sheathing stipules conspicuous; panicle dense; pedicels jointed near the middle, shorter than the fruit.—Dry sandy washes and sandy plains.

2. ***R. crispus*** L. CURLY DOCK. Stoutish, about 5.8 dm. high; leaves elliptical to oblong-lanceolate, wavy-margined; flowering branches strict, with few leaves, the whorls dense and mostly crowded; pedicels twice as long as the fruit, jointed near the base, recurved (as also in the next); inner sepals in fruit bearing (as also in nos. 3 to 5) callous-like grains or 1 or 2 naked.—Weed, nat. from Eur.

3. ***R. conglomeratus*** Murr. GREEN DOCK. Stems slender, 8.6 to 14 dm. high; leaves ovate or mostly oblong, slightly undulate; flowering branches very long, naked or with a leaf subtending some or all of the remote whorls; pedicels as long as or shorter than the fruit; callous grains mostly 3 and smooth.—Valleys.

4. ***R. salicifolius*** Weinm. WILLOW DOCK. Stems commonly tufted, about 5.8 dm. high; leaves plane, glaucous, lanceolate, acute at both ends; flowering branchlets short (4.8 cm. long), with dense crowded and leafless whorls, or 1 or 2 lower whorls remote and leafy; pedicels rather shorter than the fruit.—Valleys.

5. ***R. pulcher*** L. FIDDLE DOCK. Stem slender but rigid, widely branched above, the branches zigzag; leaves oblong or fiddle-shaped; flowering branches simple, divaricate, sparsely leafy, the dense whorls remote; callous grain often solitary.—Wayside weed, nat. from Eur.

6. ***R. acetosella*** L. SHEEP SORREL. Stems tufted; staminate and pistillate flowers on different plants.—Weed, nat. from Eur.

4. RHEUM L.

Perennial herbs. Leaves large, rounded, mostly basal. Flowers white, in long panicles. Stamens 9 or 6. Ovary 3-angled; styles 3; stigmas capitate or cuneate. (Greek rha, the ancient name.)

1. ***R. rhaponticum*** L. GARDEN RHUBARB. The large fleshy stalks, filled with most excellent acid juice, are cooked in late winter and spring as a substitute for fruit.—Native of southern Siberia.

5. PTEROSTEGIA F. & M.

Slender weak diffuse annual with dichotomous stems and opposite leaves. Flowers solitary and sessile in the axil of a bract-like involucre. Involucre rounded and 2-lobed or -toothed, in fruit becoming enlarged and thin, loosely inclosing the achene and bearing 2 sac-like protuberances on the back. Calyx commonly 6-parted. Stamens 3 or 6. (Greek pteron, a wing, and stege, a covering, in reference to the bract.)

1. ***P. drymarioides*** F. & M. Leaves roundish and notched at apex

or even cleft, or fan-shaped, or obcordate; flowers reddish, less than 2 mm. long.—Shade of oaks or rocks.

6. CHORIZANTHE R. Br.

Leaves mostly basal, disappearing early, the cauline leaves mostly reduced to bracts. Flowers 1 or several in a 3 or 6-toothed involucre, the teeth cuspidate or awned. Flowers included within the involucre or the calyx protruding. Calyx 6-parted or -cleft, colored. Stamens 9, 6 or 3. (Greek chorizo, to divide, and anthos, flower, on account of the parted calyx.)

Involucre urnshaped, the teeth bordered by a broad scarious membrane.....
 1. *C. membranacea*.
 Involucre cylindric, not scarious-margined.....2. *C. staticoides*.

1. **C. membranacea** Benth. Erect, 1.4 to 4.3 dm. high, simple below, branching above; leaves linear, sessile or short-petioled, glabrous above; involucre in solitary capitate clusters along the branches or almost terminal, white-scarious between the teeth; calyx woolly.—Foothills.

2. **C. staticoides** Benth. TURK'S RUG. Stems 1 or several from the base, cymosely dichotomous, 9.6 to 24 cm. high, fragile at the joints; leaves reddish, soft-pubescent or grayish, white-woolly underneath; involucre sessile, congested at the end of the branchlets or at the joints; calyx white to deep rose, exserted.—Dry sandy plains and foothills.

7. ERIOGONUM Michx.

Leaves alternate or whorled, or often wholly basal, without stipules. Flowers several to many in a 4 to 8-toothed or -lobed involucre. Pedicels of the flowers more or less exserted, intermixed with narrow bractlets. Calyx colored, 6-parted or -cleft, persistent. Stamens 9. Styles 3. Stigmas capitate. (Greek erion, wool, and gonu, knee or joint, the nodes hairy in some species.)

Calyx not stipe-like at base; involucre turbinate or cylindric.

Involucre turbinate, not angled, on scattered pedicels; inner and outer calyx-lobes very unlike.....1. *E. angulosum*.

Involucre cylindric, angled, always sessile.

Involucre solitary, usually scattered.

Stems, leaves and involucre white-woolly.....2. *E. virgatum*.

Stems glabrous, rarely a little woolly below.....3. *E. vimineum*.

Involucre 2 to several in heads, rarely solitary.

Shrubs, at least woody at base; stems very leafy.

Heads terminal on the 2-forked peduncles, or racemosely disposed on the forks; leaves mostly ovate or roundish....

4. *E. parvifolium*.

Heads umbellate, sometimes solitary and terminal; leaves oblong or linear.....5. *E. fasciculatum*.

Herbaceous or mostly so, leafy only at base.

Stems not fistulous; heads 1 or few.....6. *E. latifolium*.

Stems fistulous; heads several to many.....7. *E. nudum*.

Calyx stipe-like at base; involucre in umbels.....8. *E. umbellatum*.

1. **E. angulosum** Benth. Diffusely branching from near the base, the branches 2-forked and 4 to 6-angled; basal leaves roundish to broadly oblong, on short petioles, the upper mainly lanceolate and sessile or nearly so; filiform stalks of the glabrous involucre terminal or borne in the forks; bractlets firm and rather broad; calyx-divisions pink with a red-purple midvein; outer divisions ovate, the inner narrower.—Hills and plains.

2. *E. virgatum* Benth. Stem slender, erect, simple or with few branches, 3 to 8.6 dm. high; leaves in whorls on lower part of stem or basal, oblanceolate; bracts lanceolate; calyx white, buff, sulphur-yellow or pink.—Stream beds.

3. *E. vimineum* Dougl. Stems 1 or several, 7 to 43 cm. high, much branched; leaves orbicular to broadly ovate, white-tomentose below; involucre very narrow, strongly angled; flowers few, rose-color or yellowish; outer calyx segments obovate, inner oblong.—Coast Range hills.

4. *E. parvifolium* Sm. Shrub, or woody only at base, 3 to 8.6 dm. high; branches densely leafy with fascicled leaves; leaves thick, oblong-lanceolate to roundish, dark green and glabrous above, white with a dense felt beneath; involucre densely woolly on inside at throat; calyx white; filaments hairy at base.—Sand dunes and hillsides near the coast.

5. *E. fasciculatum* Benth. WILD BUCKWHEAT. Low shrubs 6 to 14 dm. high; stems very leafy with fascicled leaves which are narrow, strongly revolute, tomentose beneath and often glabrate above; heads borne in an umbel, or the umbel often contracted or head-like; bracts most foliaceous; flowers rose-color or whitish.—Mountains and mesas, S. Cal.

6. *E. latifolium* Sm. Stout, woolly throughout; leaves oblong to ovate, upper surface becoming glabrous, lower surface densely woolly; heads of involucre 1 to 4 in a terminal cluster on an erect naked stalk or the stalk branched at summit and the heads in an umbel; involucre tomentose; bractlets densely tomentose; flowers pale rose-color.—Sea-coast.

7. *E. nudum* Dougl. Stems 1 or several, simple below, branching above and bearing many terminal and lateral heads of flowers; leaves mostly in a basal cluster; involucre glabrous or nearly so, 3 to 6 in each head; bractlets glabrous; flowers white or reddish, sometimes sulphur-yellow.—Hill country.

8. *E. umbellatum* Torr. SULPHUR FLOWER. Peduncles erect from a branching woody base, naked, 7.2 to 12 cm. high; leaves ovate, glabrate above, white-woolly beneath; umbels simple, subtended by a whorl of linear to obovate bracts; flowers sulphur-yellow; filaments pilose on lower half.—Higher Sierra Nevada and Coast Ranges.

SAURURACEAE. LIZARD-TAIL FAMILY

Ours perennial herbs with scape-like stems. Leaves alternate, entire, petioled, mostly in a basal cluster. Flowers in a dense terminal spike without calyx or corolla. Stamens 6 to 8. Ovary 1-celled, with 3 or 4 stigmas. Fruit a pod.—Species 4, in temperate and sub-tropical Asia and N. Am.

1. ANEMOPSIS Hook.

Stolon-bearing herbs with aromatic rootstock. Spike conical, surmounted at base by a showy white involucre of 5 to 8 bracts, each flower (except the lowest) also subtended by a small white bract. (Greek anemone, and ophis, appearance, the inflorescence resembling the flower of anemone.)

1. **A. californica** (Nutt.) Hook. YERBA MANSA. Stems hollow, 1.4 to 2.8 dm. high, with a clasping leaf above the middle and a cluster of 1 to 3 petioled leaves in the axil; leaves elliptic-oblong, somewhat heart-shaped at base; bracts of the involucre 1.2 to 3 cm. long.—Moist alkaline lands. An infusion of the root is used by Spanish-Californians as a liniment for skin troubles and as a tea for disorders of the blood.

ARISTOLOCHIACEAE. BIRTHWORT FAMILY

Low herbs or twining shrubs. Leaves alternate, simple, cordate, long-petioled. Calyx conspicuous, lurid or greenish, 3-lobed. Corolla none. Stamens 6 to 12. Ovary inferior, 6-celled. Fruit a globular or cylindrical pod.—Species 210, warm parts of the earth.

Low herb; calyx regular.....1. ASARUM.
Woody climber; calyx irregular.....2. ARISTOLOCHIA.

1. ASARUM L.

Herbs with fragrant creeping rootstocks which bear a pair of kidney-shaped or heart-shaped leaves and a short-stalked flower close to the ground. Calyx lurid, bell-shaped, the limb 3-parted into long spreading or recurved lobes. Stamens 12, with pointed tips. Style short, 6-lobed. Pod globose, fleshy, bursting irregularly. (Derivation obscure.)

1. **A. caudatum** Lindl. WILD GINGER. Evergreen; calyx-lobes drawn out into tails 2.4 to 5.4 cm. long.—Deep shade of woods.

2. ARISTOLOCHIA L. PIPE VINE

Twining woody plant with ovate-cordate leaves and a tubular greenish and purplish calyx which is strongly curved and pipe-shaped. Stamens 6 to 8, consisting of sessile anthers adnate to the short style which has a 3 to 6-lobed stigma. Pod 6-valved. (Greek aristos, best, locheia, parturition, from its supposed efficacy in child-birth.)

1. **A. californica** Torr. DUTCHMAN'S PIPE. Leaves deciduous; pod 6-winged.—Wooded hill country.

ULMACEAE. ELM FAMILY

Trees or shrubs without milky juice. Leaves alternate, usually oblique. Flowers perfect or unisexual, irregular. Corolla none. Sepals 4 or 5, rarely 3 to 7. Stamens of same number, opposite the sepals, not elastically incurved. Ovary superior, 1-celled, 1-ovuled, the ovule suspended, anatropous.—About 140 species generally distributed in all but the polar regions.

1. ULMUS L. ELM

Trees. Flowers perfect or rarely polygamous, in axillary clusters or racemes. Fruit a dry nutlet with a broad (rarely narrow) membranous wing all around. (Ancient Latin name of the elm.)

1. **U. racemosa** Thomas. CORK ELM. Broad-crowned tree 6 to 15 m. high; branchlets pubescent, corky-winged when older; buds pubescent; leaves oval to oblong-obovate, pubescent beneath; wing with shallow notch at apex.—Cult. from eastern U. S. as a street and shade tree.

URTICACEAE. NETTLE FAMILY

Mostly herbs. Leaves simple, alternate or opposite. Flowers unisexual, regular, wind-pollinated. Sepals 4 or 5. Stamens as many and opposite the sepals, uncoiling elastically. Ovary 1-celled, 1-ovuled. Style 1. Fruit an achene or drupe. Seeds basal, orthotropous.—About 500 species, mainly in the tropics.

1. *URTICA* L. NETTLE

Herbs with stinging hairs. Leaves opposite. Flowers in racemose, spiked or head-like clusters. (Latin name of the nettle.)

1. *U. gracilis* Ait. var. *holosericea* Jepson. CREEK NETTLE. Perennial; stem 11.5 to 28 dm. high; leaves long-ovate to lanceolate, pubescent, lower surface gray, 7.2 to 12 cm. long; flowers sessile, in spikes, the pistillate in axils above the staminate.—Along creeks and in damp spots; throughout Cal.

2. *U. urens* L. SMALL NETTLE. Annual; stem 2.8 to 4.3 dm. high; leaves elliptic to ovate, 1.2 to 3.6 cm. long, dark green; flowers more or less pediceled, the staminate and pistillate together in the same clusters.—Waste places, nat. from Eur.

MORACEAE. MULBERRY FAMILY

Trees or shrubs generally with milky juice. Leaves alternate. Flowers unisexual, arranged in catkin-like or head-like clusters. Calyx-segments generally 4. Stamens 4. Ovary 1 (or rarely 2)-celled; ovule pendulous. Stigmas 2.—About 300 species, exclusively in warmer climates. Famous plants in the family are the Bread-fruit Tree (*Artocarpus incisa* L.) of the South Sea Islands, India Rubber Tree (*Ficus elastica* Roxb.) of India, and Paper Mulberry (*Broussonetia papyrifera* Vent.) from which Japanese rice paper is made.

Flowers of the two kinds in separate inflorescences; filaments incurved in the bud; leaves folded in the bud.

Flowers usually monoecious, the pistillate in catkin-like spikes; branches not armed1. *MORUS*.

Flowers dioecious, the pistillate in a large spherical head; branches with axillary thorns.....2. *MACLURA*.

Flowers of both kinds mixed on the inside of a closed fleshy receptacle; filaments straight in the bud; leaves convolute in the bud.....3. *FICUS*.

1. *MORUS* L. MULBERRY

Trees. Leaves cordate or ovate, mostly serrate, often palmately lobed. Flowers monoecious, in short pendulous axillary catkins. Pistillate flowers with one 2-celled ovary, the 4 calyx-lobes adherent to the ovary, becoming fleshy and cohering into a long multiple fruit like a blackberry in appearance. (Latin name.)

1. *M. nigra* L. BLACK MULBERRY. Tree 7 to 14 m. high; leaves dark dull green, commonly very rough above, usually not lobed; fruit large and sweet, black or very dark colored.—Cult. from Persia.

2. *MACLURA* Nutt. BOW-WOOD

Trees. Leaves entire, slender-petioled. Pistillate flowers crowded in catkin-like spikes or heads, which become fleshy in fruit, resembling an

orange with a roughish surface. (Wm. Maclure, an American geologist.)

1. **M. pomifera** Schneid. OSAGE ORANGE. Tree 5 to 17 m. high, with furrowed orange-color bark; thorns 4.8 to 7 cm. long; leaves ovate to oblong-lanceolate, shiny; fruit subglobose, 9.6 to 14.4 cm. in diameter.—Cult. as a fence barrier or hedge plant; native of the se. U. S.

3. **FICUS** L.

Trees and shrubs, often climbers. Leaves alternate. Receptacles (in which the flowers are concealed) borne in the axils of the leaves. Stipules large, falling off as the leaves expand. Achene seed-like. (Ancient Latin name.)

1. **F. carica** L. FIG. Tree 5 to 23 m. high; leaves 3 to 5-lobed; fruit solitary, axillary, pear-shaped.—Cult. from the Levant. The first figs grown in California were brought from Spain by the Franciscans and planted in the Mission gardens. As the Mission Fig it has since been widely cultivated. About 1881 considerable numbers of the Smyrna Fig were planted, and later, through the definite introduction of the Blastophaga wasp as a pollinating agent, the industry was established on a commercial basis in the San Joaquin Valley. Cf. life history of the fig, Proceedings Cal. Fruit Growers Convention, 34th Conv. (1908), 36th Conv. (1909), 38th Conv. (1910); Science 10:570,—1899; Proceedings Cal. Acad. Sci. ser. 2, 5:897-1003.

CANNABACEAE. HEMP FAMILY

Aromatic herbs without latex. Leaves palmately nerved, more or less divided, with persistent stipules. Flowers dioecious, greenish, small, wind-pollinated. Staminate flowers in loose compound racemes or panicles. Sepals 5. Stamens 5, with erect filaments. Pistillate flowers in close clusters or catkins. Calyx cup-like, entire, embracing the ovary and achene. Ovary 1-celled with 2 styles or 2 elongated stigmas and a pendulous curved ovule. Fruit a nutlet.—Species 3, Asia and Eur.

Stems erect; stamens drooping.....1. CANNABIS.
Stems twining; stamens erect.....2. HUMULUS.

1. **CANNABIS** L. HEMP

Rough annual herbs with watery juice and tough fibrous bark. Leaves digitate with 5 to 7 nearly linear coarsely toothed leaflets. Staminate flowers in axillary panicles, the pistillate in short axillary spikes. (An ancient Greek name.)

1. **C. sativa** L. COMMON HEMP. Tall coarse plant 2 to 3 m. high; upper leaves alternate, the others more or less opposite.—Cult. from Asia for its remarkable stem fibres, which are used for cordage, and for its seeds which yield a fat oil.

2. **HUMULUS** L. HOP

Twining vines, the stems striated and roughish with hooked hairs. Leaves opposite, rough, palmately lobed. Flowers dioecious, in axillary clusters. Staminate flowers in drooping racemes, pistillate in pairs under large bracts making a cone-like catkin. (A late Latin name of Teutonic origin.)

1. **H. lupulus** L. COMMON HOP. Rough hairy perennial herb; leaves heart-shaped, 3 to 7-lobed; staminate panicles 4.8 to 14.4 cm. long; hops oblong or ovoid, papery, straw-yellow, glandular.—Native of Eur., cult. for the pistillate catkins or hops, which possess an aromatic bitterness or lupulin derived from the yellow glands appearing on the ovary and base of the bracts. Hops are used medicinally and also in the manufacture of beer, one of the most talked of beverages in America.

ZYGOPHYLLACEAE. CALTROPS FAMILY

Herbs or shrubs, ours with opposite pinnate leaves. Flowers perfect, regular. Sepals 5. Petals 5. Stamens 10, inserted with the petals on the receptacle.—Species about 160, widely distributed in warm and tropical regions.

1. **TRIBULUS** Tourn. CALTROPS

Herbs, ours annuals. Flowers yellow, solitary on the peduncles. Ovary 5-celled; cells 3 to 5-ovuled. Fruit lobed, splitting into 5 nutlets. (Greek tribulos, ancient name of Trapa.)

1. **T. terrestris** L. PUNCTURE WEED. Stems branching from the base, trailing, 1.4 to 8.6 dm. long; herbage whitish-pubescent; petals 2 to 4 mm. long; nutlets warty on back and with 2 stout spreading spines.—Nat. from Eur., following railway lines, thence spreading as a serious pest in valley lands. The spiny fruits puncture auto tires.

OXALIDACEAE. OXALIS FAMILY

Herbs with alternate or basal 3-foliolate leaves and regular flowers. Sepals 5. Petals 5. Stamens 10, united at base. Styles 5. Ovary superior, 5-celled, becoming a 5-lobed pod.—Species 230, tropical and subtropical.

1. **OXALIS** L. WOOD SORREL

Juice sour. Leaflets inversely heart-shaped, closing and drooping at night. Peduncles axillary, few to many-flowered. (Greek oxus, sour, the juice containing oxalic acid.)

1. **O. corniculata** L. YELLOW SORREL. Stems decumbent, 7 to 24 cm. long, bearing alternate leaves; peduncles axillary, bearing a 2 or 3-flowered umbel with small bracts; flowers yellow.—Lawns and vacant lots.

2. **O. oregana** Nutt. REDWOOD SORREL. Leaves all basal; peduncles scape-like, commonly 1-flowered, 2-bracted near the top; flowers white, pink or rose-color, 1.8 to 2.4 cm. long.—Shady places, Redwood belt.

GERANIACEAE. GERANIUM FAMILY

Ours annual herbs with at least the lower leaves opposite. Flowers regular, on axillary peduncles, with 5 sepals, 5 petals, and 5 or 10 stamens. Ovary superior, deeply 5-lobed, with the 5 styles united around a central much elongated axis, the parts of the ovary separating elastically when ripe into achene-like fruits bearing the persistent styles in the form of long twisted or coiled tails.—Species 360, widely distributed over the whole globe.

Stamens 10, all with anthers; leaves palmately parted.....1. GERANIUM.
 Stamens with anthers 5; leaves pinnate or pinnatifid, or roundish-cordate.....
 2. ERODIUM.

1. **GERANIUM** L. CRANESBILL

Stems forking and leaves palmately parted. Peduncles 1 to 3-flowered. Stamens 10. (Greek geranos, a crane, from the elongated fruit-bearing beak.)

1. **G. carolinianum** L. CAROLINA GERANIUM. Leaf-divisions more or less cut or toothed, the ultimate segments broad; petals light pink, 6 mm. long.—Open places.

2. **ERODIUM** L'Her. STORKSBILL

Leaves simple or pinnate. Peduncles 2 to 8-flowered. Stamens with anthers 5, the alternate filaments sterile and scale-like. (Greek erodios, a heron.)

Leaves pinnately cleft with broad acute lobes; beak of fruit 7.2 to 12 cm. long; sepals bristle-tipped.....1. *E. botrys*.

Leaves pinnately parted or divided into hooked segments; fruit 3.6 to 4.2 cm. long.

Sepals sometimes tipped with 1 or 2 short setose hairs; stipules large, obtuse.....2. *E. moschatum*.

Sepals tipped with 1 or 2 long bristle-like hairs; stipules commonly small and acute.....3. *E. cicutarium*.

1. **E. botrys** Bertol. Plants prostrate or diffuse; leaves oblong-ovate, pinnatifid with serrate lobes; sepals bristle-tipped; petals deep violet; filaments dilated and toothed.—Nat. from the Mediterranean.

2. **E. moschatum** L'Her. WHITE-STEM FILAREE. MUSK CLOVER. Leaves 4.8 or 7.2 to 43.2 cm. long, the basal ones forming a close broad rosette upon the ground; leaflets ovate to elliptical, serrate or sparsely cut; sepal tips not bristle-bearing; petals rose-purple, 6 mm. long; filaments winged at base and toothed.—Orchards and vineyards; naturalized Mediterranean plant.

3. **E. cicutarium** (L.) L'Her. RED-STEM FILAREE. Very like no. 2 but leaflets nearly oblong and pinnatifid; sepal tips with 1 or 2 bristles; filaments little dilated at base, not toothed.—Far more common than no. 2 and found everywhere on hills, plains and deserts. It is also naturalized from the Mediterranean and is a valuable forage plant.

LIMNANTHACEAE. MEADOW-FOAM FAMILY

Ours annual herbs with alternate pinnately divided leaves and solitary flowers on axillary peduncles. Sepals and petals 5 (rarely 4). Stamens 10. Carpels 5, sub-globose and nearly distinct (but with a common style 5-cleft at apex), when ripe separating into smooth or roughish seed-like pieces.—Species 5, North America.

1. **FLOERKEA** Willd.

Low somewhat succulent plants. Sepals valvate in the bud, as many hypogynous glands alternating with them. (H. G. Floerke, a German botanist.)

1. **F. douglasii** Baill. MEADOW-FOAM. Stems branching from the base, 1.4 to 3.3 dm. long; herbage glabrous, yellowish green; leaf-divisions lobed or cleft; peduncles at length 4.8 to 9.6 cm. long; petals obovate-cuneate, yellowish and white or roseate at tip, or wholly white, 1.2 to 1.8 cm. long.—Low wet places in valleys.

POLYGALACEAE. POLYGALA FAMILY

Perennial herbs or bushes with alternate simple leaves. Flowers irregular, resembling the papilionaceous flowers of Leguminosae, but not like them in structure, borne in terminal racemes. Stamens (in ours) monadelphous. Ovary simple, superior.—Species about 400, temperate and tropical regions.

1. **POLYGALA** L. MILKWORT

Stems often with milky juice. Sepals 5, thin, the two lower and the upper keeled one of about the same size, the two lateral much larger, colored, and projecting like the wings of a pea-flower. Petals 3, united at base, forming a dorsal pair, the third anterior, hooded above and often beaked or crested, enclosing the stamens and style. Stamens 8, monadelphous, the tube open on one side and adnate to the base of the petals. Ovary 2-celled with one ovule in each cell; style long, curved. Capsule with thin walls, flattened contrary to the partition, rounded and often notched above, dehiscing loculicidally at the margin. (Polus, much, and gala, milk, an ancient Greek name for some shrub used as a stimulant.)

1. **P. californica** Nutt. Stems many, 7 to 19 cm. high; leaves oblong- or elliptic-ovate, 1.2 to 3.6 cm. long; flowers of two sorts, those near the root apetalous and developing most of the fruit, those of the terminal racemes with rose-purple corollas 10 to 12 mm. long.—Wooded or brush-covered slopes.

EUPHORBIACEAE. SPURGE FAMILY

Ours herbs (one species woody at base) with simple leaves. Staminate and pistillate flowers without corolla, often destitute of calyx as well, sometimes exceedingly reduced and both sorts of flowers inclosed in a calyx-like involucre. Stamens 1 to many. Ovary superior, 3 or 1-celled, forming a 3-lobed pod splitting into 2 or 3 valves.—Species more than 3000, mostly in the tropics.

Flowers with a true calyx (not borne in an involucre).

Upper leaves opposite; staminate flowers in corymbs.....1. EREMOCARPUS.

Leaves all alternate; staminate flowers in racemes.

Leaves entire, not peltate.....2. CROTON.

Leaves peltate, palmately 5 to 12-lobed.....3. RICINUS.

Flowers borne in a calyx-like involucre which has 4 or 5 teeth and bears more or less petal-like glands.....3. EUPHORBIA.

1. **EREMOCARPUS** Benth.

Low annual. Leaves 3-nerved, entire. Staminate flowers in terminal clusters, the calyx 5- or 6-parted with 6 or 7 exerted stamens. Pistillate flowers 1 or few in the axils, without calyx and with a 1-celled ovary having 4 or 5 glands at base; style one. Pod 2-valved, 1-seeded. (Greek eremos, solitary, and karpos, fruit.)

1. **E. setigerus** Benth. TURKEY MULLEIN. Stems dichotomously branched, forming a low spreading or prostrate plant 1.4 to 5.7 dm. broad, or on sterile soils the plants reduced to mere dwarfs 1 to 2 cm. high; leaves alternate or the upper opposite, ovate or round, on petioles as long; seed smooth and shining, 3 mm. long.—Low clay or gravelly hills or plains.

2. CROTON L.

Perennial herbs, woody at base, with alternate entire leaves. Staminate flowers in racemes, the calyx 5-parted with as many glands alternating with the lobes. Stamens (in ours) about 9 to 11. Pistillate flowers mostly solitary, the calyx 5-parted and the ovary 3-celled; styles twice forked. Pod 3-lobed. (Greek kroton, a tick, the seeds resembling that insect.)

1. *C. californicus* Müll. Arg. Stems branching from a woody base; herbage hoary except the green upper face of the leaves; flowers of the staminate racemes soon deciduous, leaving a naked axis; pod scurfy, 6 mm. broad.—Sand hills near the ocean.

3. RICINUS L.

Herbs or small trees. Leaves large, with prominent glands on petioles. Raceme with the staminate flowers above and the pistillate below. Stamens many. Styles 3. Fruit a large 3-lobed pod with 3 large seeds. (Latin ricinus, a tick, on account of the shape and markings of the seed.)

1. *R. communis* L. CASTOR BEAN. Ours an annual 1 to 4 dm. high; in the tropics perennial and 8 to 11 m. high.—Cult. from the Old World for ornament and from the earliest times for the oil of the seeds. The oil is an effective yet harmless purgative, though its active principle is not yet known. All children will testify that its taste is so uniquely nauseous as to be a scandalous outrage.

4. EUPHORBIA L. SPURGE

Involucres solitary in the forks or in terminal umbels, with 4 or 5 teeth alternating with as many glands, the glands often with colored margin. Several staminate flowers (each consisting of a single stamen) and one pistillate flower (consisting of a single pistil with a 3-celled ovary and 3 bifid styles) are included in an involucre which itself resembles a flower. Fruit a 3-celled pod, each 1-seeded. (Euphorbus, King Juba's physician.)

1. *E. serpyllifolia* Pers. THYME-LEAF SPURGE. Stems prostrate; herbage glabrous; leaves small, all opposite and more or less unequal at base, stipulate, obovate or oblong, serrulate at apex; glands of the involucre with a petal-like white margin.—Stream beds and low grounds.

2. *E. leptocera* Engelm. Stem erect, branching at base, 2.4 to 3.8 dm. high, the branches forking above; lower leaves alternate, obovate to spatulate, entire; uppermost leaves opposite or in threes, more or less triangular; stipules none; no colored margins to the glands.—Valleys and low hills.

ANACARDIACEAE. SUMAC FAMILY

Trees or shrubs with resinous or milky acrid juice and alternate leaves. Flowers in clusters, small, regular, either perfect, polygamous or dioecious. Calyx commonly 5-parted, a disk lining its base. Petals commonly 5, the stamens as many or twice as many. Pistil 1, superior; ovary 1-celled, 1-ovuled; styles or stigmas 3. Fruit a dry drupe.—About 120 species in subtropical and warm temperate regions.

Stamens 5; drupe flattened.....1. RHUS.
Stamens 10; drupe globose.....2. SCHINUS.

1. RHUS L. SUMAC

Shrubs or small trees. Leaves (in ours) simple or 3-foliolate. Stamens 5. Drupe flattened, with rather thin and dry flesh. (Ancient name.)

Leaves 3-foliolate: deciduous shrubs, throughout Cal.

Flowers greenish, in panicles; drupe whitish, the stone rough.....1. *R. diversiloba*.

Flowers yellowish, in spikes; drupe red, the stone smooth.....2. *R. trilobata*.

Leaves simple, leathery; evergreen shrubs; flowers in panicles; S. Cal. -

Panicle much branched, with slender divisions, glabrous or nearly so; drupe whitish.....3. *R. laurina*.

Panicle composed of stout spikes, finely pubescent; drupe red.

Leaves elliptic, rounded at apex.....4. *R. integrifolia*.

Leaves ovate, acute or acuminate.....5. *R. ovata*.

1. *R. diversiloba* T. & G. POISON OAK. Erect shrub 11 to 23 dm. high, or the stems climbing tree trunks by adventitious rootlets; leaflets variable, roundish to ovate, variously lobed or toothed; panicles axillary, appearing with the leaves, somewhat pendulous; flesh of the whitish drupe marked with black fibres.—Hills, lower mountains and along valley streams. The plant juice is highly poisonous as a skin irritant, although some people have immunity. The poison is a non-volatile oil and one may be poisoned only by actual contact or through clothing or other objects which have been in contact with the bushes, or through smoke particles. It is more widely spread in California than any other shrub.

2. *R. trilobata* Nutt. SQUAW BUSH. Diffusely branching, 6 to 14 dm. high; leaflets broadly ovate or elliptic, cuneate at base, crenate or lobed; flowers pale yellow, appearing before the leaves, borne in terminal often clustered spikes; drupe viscidly pilose.—Narrow valleys or flats in cañon bottoms. The slender but tough pliable branchlets were prized in basket-making by the native tribes.

3. *R. laurina* Nutt. LAUREL-SUMAC. Very leafy shrub, exhaling an aromatic odor; leaves ovate or lanceolate, abruptly mucronate, 3.6 to 12 cm. long; panicle dense; flowers 1 to 2 mm. long; drupe whitish, very small.—S. Cal. valleys near the sea. In San Diego Co. it is esteemed as a bee-food shrub.

4. *R. integrifolia* B. & H. LEMONADE-BERRY. Shrub 8.5 to 28 dm. high; leaves entire or with a few small sharp teeth, 2.4 to 6 cm. long; panicles ashy-puberulent; flowers 4 to 6 mm. long; bracts, sepals and petals ciliolate.—S. Cal., often forming thickets near the coast. The excretion on the surface of the berry is used for an acid drink.

5. *R. ovata* Wats. SUGAR-BUSH. Similar to no. 4; leaves shining; panicle dull-puberulent or glabrate.—Dry hills, S. Cal. The sweetish waxy covering of the berries is used by the native tribes for sugar.

2. SCHINUS L.

Tree. Leaves with many leaflets. Flowers yellowish green, the staminate and pistillate on separate plants, borne in axillary and terminal panicles. Stamens 10. Drupe globose, oily. (Greek name for the mastic-tree, *Pistacia lentiscus*; applied to this genus on account of the resinous mastic-like juice of some species.)

1. *S. molle* L. PEPPER-TREE. Leaflets numerous, lanceolate, serrate;

drupes red, size of a pea.—S. Am. species, commonly planted as a street-tree, especially in S. Cal.

RUTACEAE. RUE FAMILY

Herbs, shrubs or trees. Leaves usually alternate, simple or compound, glandular with pellucid dots. Flowers regular. Sepals 4 or 5. Petals 4 or 5. Stamens 8 to 10 or more. Ovary superior, 2 to 5-celled, seated on a glandular disk. Fruit a capsule or samara, or fleshy and indehiscent.—About 900 species, mostly tropical. The native representatives are *Thamnosma montana* Torr. & Frem. (Turpentine Broom), a low desert shrub with alternate simple leaves and purple flowers; *Cneoridium dumosum* Hook. f., a bush of San Diego Co., with opposite simple leaves and drupe-like fruits, and *Ptelea baldwinii* T. & G. (Hop-tree), a shrub of the Coast Ranges with 3-foliolate leaves and fruit a samara.

1. CITRUS L.

Small evergreen more or less spiny trees or shrubs. Leaves unifoliately compound with winged or margined petioles. Flowers white, fragrant. Stamens numerous, the filaments united at base into several bundles. Fruit a many-seeded, large berry (hesperidium) with a thick rind. (Ancient name of a fragrant African wood, afterwards transferred to the citron.)

Petals white above, tinged with red below; fruit mostly elongated....1. *C. medica*.
Petals white on both surfaces; fruit commonly roundish.

Petioles broadly winged; branchlets and under side of leaves downy-pubescent.....2. *C. decumana*.

Petioles slightly winged; branchlets and leaves glabrous.....3. *C. sinensis*.

1. ***C. medica* L. CITRON.** Shrub or small tree with large oblong leaves; leaves apparently not jointed between blade and petiole; petioles wingless; fruit oval or oblong, bluntly apiculate, lemon-yellow; rind thick, fragrant, coarsely roughened or furrowed.—Cult. from China. Var. **LIMONUM.** Lemon. Small tree; leaves with an obvious joint between blade and petiole; petiole narrowly margined; fruit distinctly elongated, the rind not rough, with an abundant and acid juice. Var. **LIMETTA** (Risso.) Engl. Lime. Small tree; leaves small; petioles narrowly winged; flowers small; fruit small, greenish-yellow, very acid.—Cult. from India.

2. ***C. decumana* Murr. GRAPEFRUIT. POMELO. SHADDOCK.** Large tree; petioles broadly winged; flowers large; fruit large, pale lemon-yellow when ripe; pulp acid.—Cult. from the tropics of Asia. It is called grape-fruit because the fruits are borne in clusters, but the name also has significance by reason of the delicious juice which recalls that of the Muscat of Alexandria.

3. ***C. sinensis* Osbeck. COMMON or SWEET ORANGE.** Medium-sized trees with large ovate leaves; petioles narrowly winged, articulated both with the blade and the stem; style deciduous; fruit globose to sub-globose, golden yellow; pulp usually sweetish.—Cult. from Asia. Leading horticultural varieties in Cal. are the Washington Navel and Valencia.

SIMARUBACEAE. QUASSIA FAMILY

Shrubs or trees with alternate (rarely opposite) pinnate leaves. Flowers unisexual, regular. Sepals and petals 3 to 5. Disk prominent, 10-lobed; stamens 6 to 10. Fruit drupe-like or forming a berry or samara.—Species 140, chiefly tropical.

1. AILANTHUS Desf.

Large trees. Leaves alternate, odd-pinnate. Flowers small, in large terminal panicles, polygamous, the staminate very ill-scented. Fruit of 1 to 5 distinct oblong samaras, with the compressed seed in the middle. (Ailanto, a Malakka name, meaning Tree of Heaven.)

1. **A. glandulosa** Desf. TREE OF HEAVEN. Tree 9 to 17 m. high; leaves 4.3 to 5.7 dm. long; leaflets with 2 to 4 coarse teeth near the base, each with a large gland beneath; samaras 3.6 cm. long.—Cult. from China. It is the only exotic tree in California which is markedly spontaneous. It has in some localities become a pest as a tree weed.

MELIACEAE. MELIA FAMILY

Trees and shrubs with alternate often pinnate leaves. Flowers small. Sepals 4 or 5. Petals 4 or 5. Stamens 8 to 10 and with filaments united into a tube which is entire or lacerate. Fruit a capsule or berry.—About 600 tropical species.

1. MELIA L. PRIDE OF INDIA. CHINA TREE

Leaves twice compound. Leaflets ovate and sharply toothed. Flowers purplish, in large compound panicles. Fruit a berry-like drupe with a bony 5-celled stone. (Old Greek name of the Ash Tree.)

1. **M. azederach** L. var. **umbraculiformis** Berckm. TEXAS UMBRELLA TREE. Tree 8 to 11 m. high, very dense-headed and umbrella-like by reason of the radiating branches and drooping foliage; berry yellowish.—Cult. from Asia as a street tree in the hot interior valleys.

JUGLANDACEAE. WALNUT FAMILY

Trees with alternate pinnate leaves. Staminate and pistillate flowers on the same plant, the former in catkins with an irregular calyx and several stamens, the latter solitary or 2 or more in a cluster with a 3 to 5-lobed calyx, the tube of which is adherent to the ovary. Fruit a bony nut covered by a husk.—About 35 species in the north temperate zone, including many species of *Carya* (Hickory, Butternut and Pecan.)

1. JUGLANS L. WALNUT

Branchlets hollow, chambered by pithy plates. Leaflets many. Staminate catkins long and pendulous; stamens 12 to 40. Pistillate flower with a 4-toothed calyx, 2 styles and a 1-celled ovary. Nut incompletely partitioned, containing a single sweet edible seed so lobed as to fit the irregularities of the cavity. (Latin Jovis, Jupiter and glans, nut.)

Leaflets 9 to 25; husk, when dry, persistent on the thick-shelled nut.

Nuts deeply grooved.....1. *J. californica*.
Nuts obscurely or not at all grooved.....2. *J. hindsii*.

Leaflets usually 7 to 9, almost entire; husk (when dry) falling away from the thin-shelled nut.....3. *J. regia*.

1. *J. californica* Wats. SOUTHERN CALIFORNIA BLACK WALNUT. Tree 4.3 to 8.6 m. high, commonly with several stems from the base, the crown much broader than high; leaflets 11 to 19, oblong-lanceolate, serrate.—Coastal S. Cal.

2. *J. hindsii* Jepson. CALIFORNIA BLACK WALNUT. Tree 8 to 18 m. high, with a single erect trunk, the crown much higher than broad; leaflets lanceolate, 7.2 to 12 cm. long.—Central Cal., on old Indian camp-sites. It is extensively used as a stock-graft for English Walnut.

3. *J. regia* L. ENGLISH WALNUT. Tree 5 to 11 m. high; leaflets 5 to 13, oval, almost entire.—Cult. from Asia and more properly known as Persian Walnut. The annual crop in Cal. is about 52 million pounds.

MYRICACEAE. SWEET-GALE FAMILY

Shrubs or small trees. Leaves alternate, simple, resinous-dotted. Flowers unisexual, in catkins. Perianth none. Stamens 4 to 16. Ovary superior, 1-celled; ovule 1; stigmas 1 to 4. Fruit a nutlet.—Species about 50, mostly tropical.

1. MYRICA L.

The only genus. (Greek murike, the ancient name of the Tamarisk.)

1. *M. californica* Cham. WAX MYRTLE. Densely branched shrub or small tree 2 to 8 m. high; leaves oblong or oblanceolate-oblong, dark green, glossy, 5 to 12 cm. long; fruit berry-like, coated with a white wax.—Sand-dunes, moist flats or hillsides, near the ocean.

BETULACEAE. BIRCH FAMILY

Ours trees with alternate simple leaves and small flowers in clustered catkins. Staminate catkins pendulous, the flowers 3 in the axil of each bract and consisting of a membranous 4-parted calyx and 2 to 4 stamens. Pistillate catkins much smaller and shorter, sub-erect, the flowers 2 in the axil of each bract, without perianth, consisting of a pistil with 2 styles and a 2-celled ovary. Fruit a small flattened 1-seeded margined or winged nut.—Species 75, extra-tropical northern hemisphere.

1. ALNUS Hill. ALDER

Pistillate catkins woody and cone-like in fruit. (The Latin name.)

Leaf-margin plane, with small scattered glandular teeth; stamens 2, sometimes 3, 1 or 4.....1. *A. rhombifolia*.

Leaf-margin coarsely toothed, the entire margin with a narrow underturned edge; stamens 4, rarely 3.....2. *A. rubra*.

1. *A. rhombifolia* Nutt. Tree 5 to 20 m. high, the trunk brown or ashy-gray; leaves narrowed to each end from the middle, varying to ovate or elliptic; bracts of staminate catkins obtuse; stamens 2 to 4.—Interior streams, in valleys or cañons, s. to S. Cal. The wood is used for making boxes, the slender trunks for studs and rafters.

2. *A. rubra* Nutt. Tree 8 to 17 m. high, the trunk gray or white; leaves 4.8 to 14.4 cm. long, broadly ovate, often rusty beneath, the margin toothed and serrulate and commonly revolute; bracts of the staminate

catkin acute; stamens 4.—Near the coast, Santa Barbara Co. to Del Norte Co. The wood is used for piles and boats.

CORYLACEAE. HAZEL FAMILY

Shrubs with alternate simple leaves. Staminate flowers in catkins, without calyx or corolla; stamens as if 8, really 4 with forked filaments, the undivided portion of the filament in ours obsolete. Pistillate flowers several in a scaly bud, the calyx minute, adnate to the ovary and without limb; style short, with slender elongated stigmas. Fruit a nut inclosed in a leafy tubular involucre.—Species about 15, north temperate zone.

1. CORYLUS L. HAZELNUT

Leaves thin, serrulate or incised. Staminate catkins pendulous. Nut ovoid or globose. (Greek *korus*, a helmet, from the involucre.)

1. *C. rostrata* Ait. var. *californica* A. DC. Commonly 1 to 2 m. high; leaves short-villous beneath; involucre densely hispid.—Along streams. The slender wands are used as hoops in making Redwood lime barrels. Var. *TRACYI* Jepson. Leaves subglabrous beneath; involucre tube beyond nut very short.—N. Cal.

FAGACEAE. OAK FAMILY

Trees or shrubs with alternate simple leaves, and apetalous flowers. Staminate flowers in slender catkins, the calyx 2 to 8-lobed and the stamens 3 to 12. Pistillate flowers solitary or in small clusters, 1 to 3 in an involucre which in fruit becomes the cup or bur of the nut. Ovary 3-celled, 6-ovuled, only 1 ovule maturing.—About 600 species in subtropical and temperate northern hemisphere. The family is important because including so many species with strong tough wood.

Fruit an acorn; catkins simple.

Catkins unisexual, the staminate drooping.....1. QUERCUS.

Catkins erect, all with staminate flowers, pistillate flowers at base of some of them.....2. LITHOCARPUS.

Fruit a spiny bur; catkins erect, often branching, unisexual, or with pistillate flowers at base of some of the staminate catkins.....3. CASTANOPSIS.

1. QUERCUS L. OAK

Flowers greenish or yellowish. Staminate catkins commonly pendulous. Pistillate flowers 1 to each involucre, which becomes the woody cup of the acorn. Seed with thick fleshy cotyledons. (Latin name of the oak.)

Bark commonly white or whitish, wood light-colored; stamens mostly 6 to 9; stigmas sessile or nearly so; abortive ovules mostly toward base of nut.—

WHITE OAKS.

Acorns maturing the first autumn; nut glabrous on the inner surface.

Deciduous species; trees.

Branchlets pendulous; acorn cups deep, the nut long and slender; trunk bark dark brown, deeply checked.....1. *Q. lobata*.

Branchlets not pendulous; acorn cups shallow; trunk bark white, smoothish.

Leaves dark lustrous green above, rusty or pale beneath, 5 to 7-parted.....2. *Q. garryana*.

Leaves bluish-green above, pale beneath, coarsely toothed or entire.....3. *Q. douglasii*.

- Evergreen species; shrubs; leaves light green.....4. *Q. dumosa*.
 Acorns maturing the second autumn; nut tomentose or hairy within; evergreen; leaves entire or spinose-toothed.....5. *Q. chrysolepis*.
 Bark dark or black; wood dark or reddish; stamens 4 to 6; stigmas on long styles; nuts tomentose within.—BLACK OAKS.
 Acorns maturing the first autumn; leaves roundish, mostly a little cupped; evergreen6. *Q. agrifolia*.
 Acorns maturing the second autumn.
 Leaves oblong, entire or spiny-toothed, plane; evergreen.....7. *Q. wislizenii*.
 Leaves pinnately parted or toothed, the lobes always bristle-tipped; deciduous species8. *Q. kelloggii*.

1. ***Q. lobata*** Née. VALLEY OAK. Graceful tree 9 to 17 m. high, commonly with wide-spreading branches, the long hanging branchlets sometimes sweeping the ground; leaves broadly oblong or obovate, with shallowly or deeply pinnate lobes, 6 to 9.6 cm. long; nut long-conical, 3 to 5.4 cm. long, chestnut-brown when fully ripe; cup of the acorn with strongly tuberculate scales.—Rich valley lands. The wood is hard, brittle, rotting quickly, used for fuel and rarely for fence posts.

2. ***Q. garryana*** Dougl. OREGON OAK. Tree 8 to 20 m. high, the branchlets rigid, not drooping, more woolly-pubescent than in the last; leaves obovate or oblong, pinnately cleft into 5 or 7 lobes with mostly narrow sinuses, dark green above, rusty or brown beneath; acorn 2.4 to 3 cm. long; nut subglobose or oblong-cylindric, commonly obtuse; cup shallow, its scales thin, rarely tuberculate.—Coast Ranges from the Santa Cruz Mts. n. The wood is straight-grained, remarkably white and fairly strong. It is used for furniture and interior finish.

3. ***Q. douglasii*** H. & A. BLUE OAK. Tree 5 to 9 m. high with round-topped head; leaves oblong, oval or obovate, bluish-green above, mostly yellowish and pubescent beneath; margin with commonly shallow sinuses or coarsely toothed or entire, 4.8 to 7.2 cm. long; acorn 1.8 to 3.6 cm. long; nut oval, often swollen at or below the middle; cup thin, very shallow. —Dry foothills. The wood is close-grained, hard and brittle. It is extensively used for fuel.

4. ***Q. dumosa*** Nutt. SCRUB OAK. Shrub 6 to 23 dm. high, with tough rigid branchlets; leaves oblong to elliptic or roundish, irregularly spinose-serrate or lobed with angular sinuses, or entire, 1.8 to 2.4 cm. long; acorn 1.8 to 2.7 cm. long; cup saucer-shaped; nut oval to cylindric.—Chaparral slopes; highly variable.

5. ***Q. chrysolepis*** Liebm. MAUL OAK. Tree 8 to 11 m. high, or on exposed summits a low shrub; leaves mostly ovate and acute, entire or often spinose-toothed, pale green above, golden beneath or eventually lead-color, 2.4 to 7.2 cm. long; acorn 1.2 to 4.8 cm. long; nut oval or ovate, 1.2 to 4.8 cm. long; cup shallow, typically like a yellow turban.—Higher ridges and cañon walls. The wood is hard, strong, very fine-grained, very tough and is used for mauls, tool-handles, machine bearings, wagon parts, furniture and floors.

6. ***Q. agrifolia*** Née. COAST LIVE OAK. Tree with broad low top, 5 to 11 m. high; leaves oblong to roundish, spinose-toothed or entire, 3.6 to 7.2 cm. long; acorn 1.8 to 3.6 cm. long; nut elongated-ovate; cup top-shaped, the scales thin.—Coast Range valleys and mountains. The wood

is hard, heavy and moderately strong. It is used for firewood and charcoal. Foliage branches are cut from the trees for browsing to save range cattle in the starvation years in California.

7. **Q. wislizenii** A. DC. INTERIOR LIVE OAK. Tree 7 to 11 m. high; leaves broadly oblong to lanceolate, entire or spinose-toothed, mostly 2.4 to 3.6 cm. long; acorn 2.4 to 3.6 cm. long; nut slender-conical, acute; cup top-shaped or almost tubular, the scales thin.—Interior streams and foothills. The wood is tough and strong but rots quickly in contact with soil. It is used extensively for firewood.

8. **Q. kelloggii** Newb. CALIFORNIA BLACK OAK. Tree 5 to 10 m. high; leaves elliptic or obovate in outline, pinnately parted by sinuses into 5 to 7 lobes with bristle-pointed teeth, 7.2 to 16.8 cm. long; acorn 2.4 cm. long; nut broadly oblong, obtuse; cup deeply hemispherical.—Valleys and mountain ridges. The wood is heavy and hard and is sometimes used for wagon parts by rural artisans.

2. LITHOCARPUS B1. TAN OAK

Evergreen trees or shrubs with erect catkins. Catkins wholly staminate, or with pistillate flowers at the base of some of the catkins. Pistillate flowers 1 in an involucre. Fruit an acorn, the cup with linear or subulate spreading scales. (Greek lithos, rock, and karpos, fruit, referring to acorn.)

1. **L. densiflora** H.&A.) Rehd. TAN OAK. Tree 6 to 30 m. high; leaves oblong to elliptic-oblong, tomentose when young, 4.8 to 12 cm. long, with conspicuous parallel nerves ending in the teeth of the margin; acorn 1.8 to 3 cm. long; nut oval; cup shallow.—Coast Ranges, toward the coast. The bark is a valuable tanning agent in the production of high grade heavy leather; about 20,000 cords are used annually in California. The wood is straight-grained and white and is sometimes used for flooring.

3. CASTANOPSIS Spach. CHINQUAPIN

Ours evergreen trees or shrubs. Leaves entire. Catkins erect, some of them wholly staminate, some with pistillate flowers at base. Staminate calyx 5 to 6-parted, the stamens mostly twice as many. Pistillate flowers 1 to 3 in an involucre which becomes a spiny bur enclosing the nuts. Fruit ripening the second season. (Greek kastanea, chestnut, and ophis, resemblance.)

1. **C. chrysophylla** A. DC. GIANT CHINQUAPIN. Tree 15 to 25 m. high; bark thick and rough; leaves oblong, mostly acute at both ends, usually long-pointed, 6 to 13 cm. long; involucre irregularly 4-valved; seed edible.—Mountains of Mendocino and Humboldt Cos. Var. **MINOR** Benth. Golden Chinquapin. Shrub 8 to 43 dm. high; leaves trough-like, very golden below.—Rocky ridges and slopes, Monterey to Humboldt Co., mostly near the sea.

2. **C. sempervirens** Dudley. BUSH CHINQUAPIN. Spreading, shrub 3 to 23 dm. high with thin smooth brown bark; leaves mostly plane, oblong, sometimes lanceolate-oblong, usually obtuse, 3.6 to 7.2 cm. long.—Dry mountain slopes or rocky ridges, but not near the sea.

SAPINDACEAE. BUCKEYE FAMILY

Trees with opposite palmately compound leaves, irregular flowers, 5-lobed calyx, 4 or 5 petals, 5 to 7 stamens and a 3-celled ovary becoming a leathery dehiscent pod.—Species 22, north temperate zone.

1. **AESCULUS** L. HORSE CHESTNUT

Flowers showy, crowded in a terminal cylindrical cluster, mostly sterile, usually but 1 or 2 in each cluster setting fruit. Petals slightly unequal, with claws. Ovules 2 in each cell, commonly but 1 ovule in the ovary maturing, the pod therefore with one large seed. (Latin name of an Italian oak with edible acorns.)

1. **A. californica** (Spach) Nutt. CALIFORNIA BUCKEYE. Low broad-headed tree 2 to 7 m. high; leaflets 5 to 7; flower-clusters 10 to 14 cm. long, ill-scented; seeds smooth and polished, reddish-brown, 3.6 to 6 cm. in diameter.—Low hills.

ACERACEAE. MAPLE FAMILY

Trees with opposite leaves and small regular flowers. Calyx 5-lobed. Petals 5 or none. Stamens 7 to 10. Styles 2, long. Ovary 2-lobed, 2-celled, becoming a pair of winged fruits (samaras).—Species 110, mostly upland countries of northern hemisphere.

ACER L. MAPLE

Leaves simple or compound. Flower clusters always drooping. (The Latin name.)

1. **A. macrophyllum** Pursh. BIG-LEAF MAPLE. Tree 5 to 8 m. high or more; leaves simple, roundish in outline, 7.2 to 24 cm. broad, palmately parted into 5 broad mostly 3-lobed divisions; flowers in racemes, greenish or dull white; petals present; stamens 7 to 9; body of fruit short-bristly.—Along streams. Highly valued as a street tree. The wood is close-grained, rather hard, takes a high polish, and works easily.

2. **A. negundo** L. var. **californicum** Sarg. CALIFORNIA BOX ELDER. Tree 5 to 14 m. high; leaves pinnate, the leaflets variable, serrate, cut or lobed; staminate and pistillate flowers on different trees; petals none; staminate flowers clustered on hair-like pedicels; stamens 4 or 5; pistillate flowers in racemes; samaras finely pubescent.—Along streams. Often used as a highway tree.

VITACEAE. VINE FAMILY

Woody plants, usually climbing by tendrils, with alternate simple or palmately compound leaves and small flowers. Calyx minute. Petals 4 or 5, with as many opposite stamens. Ovary 2-celled, becoming a 1 to 4-seeded berry.—About 450 species of tropical and subtropical distribution.

Leaves simple; tendrils coiling about the support.....1. **VITIS**.
Leaves palmately compound; leaflets 5 or 3, often but 1; tendrils attaching themselves by an adhesive disk at tip.....2. **AMPELOPSIS**.

1. **VITIS** L. GRAPE

Climbing by the coiling of naked tendrils. Leaves simple, rounded, or ovate, heart-shaped at base. Flowers in very fragrant clusters, the petals

falling off without opening. Ovary surrounded by a nectar-secreting disk which fills the short truncate calyx. (Classical Latin name.)

1. *V. californica* Benth. CALIFORNIA WILD GRAPE. Leaves for the most part slightly or not at all lobed, coarsely or minutely dentate; fruiting clusters 4.8 to 9.6 cm. long, the fruit purple, with a bloom, 6 or 8 mm. in diameter.—Along streams, climbing trees and often enshrouding them completely in its drapery of foliage.

2. *V. vinifera* L. COMMON GRAPE VINE. Leaves lobed or sinuately toothed, glabrous or downy; fruiting clusters ovate or cylindrical, loose or crowded; fruit purple, blue, black, white, pink or red.—Cult. from Asia Minor, the original wild stock of the horticultural varieties known as Muscat, Chasselas, Tokay, Morocco, Zinfandel, Rose of Peru, Mission, Sweetwater, and many others. The latter varieties are wine grapes, of which large quantities are grown in California. Before 1918 prices averaged \$5.00 to \$25.00 a ton; since 1918 the average has been about \$80.00 to \$125.00 a ton.

2. AMPELOPSIS Michx.

Climbing plants, the tendrils fixing themselves by sucker-like disks at the tips. Leaves palmately compound. Leaflets 5, or even only 1, rarely 3. Petals thick, expanding before they fall. Berry bluish-black. (Greek ampelos, vine, and opsis, likeness.)

1. *A. tricuspidata* Sieb. & Zucc. JAPANESE IVY. BOSTON IVY. Branching profusely and covering walls, adhering by much-branched tendrils; leaves rarely with 3, commonly with 1 leaflet which is jointed to the petiole and falls in autumn before the petiole falls; leaflets very variable, roundish, ovate or cordate, serrate, commonly 3-lobed, thickish and shining.—Cult. from Japan.

2. *A. quinquefolia* Michx. VIRGINIA CREEPER. Climbing extensively; leaflets 5, lance-oblong, coarsely serrate, changing to crimson in autumn.—Cult. from the eastern United States.

RHAMNACEAE. BUCKTHORN FAMILY

Shrubs or small trees with simple leaves and caducous stipules. Flowers small, regular, stamens, petals and lobes of the calyx 4 or 5. Petals inserted with the stamens on a disk lining the calyx-tube, sometimes none, commonly with claws. Stamens opposite the petals. Ovary 3- (2 to 4-) celled, free or adnate to base of calyx. Style simple or 3- (2 to 4-) cleft. Fruit a pod or berry-like.—About 550 species, generally distributed over the earth.

Calyx free from the ovary; fruit a berry.....1. RHAMNUS.
Calyx adnate to base of ovary; fruit a dry pod.....2. CEANOTHUS.

1. RHAMNUS L. BUCKTHORN

Leaves alternate. Flowers greenish, in axillary clusters. Petals small or none. Fruit berry-like, containing 2 to 4 seed-like bony nutlets. (The ancient Greek name.)

Flowers with petals; berry black.

Evergreen shrub; leaves thickish; common, wide spread.....1. *R. californica*.

Small deciduous tree; leaves thinnish; North Coast Ranges....2. *R. purshiana*.

Flowers without petals, or the petals very minute; berry red.....3. *R. crocea*.

1. **R. californica** Esch. COFFEE BERRY. Evergreen shrub, 11.5 to 20 dm. high; leaves oblong, 2.4 to 4.8 cm. long; petals minute; berry globose or oval, 6 to 8 mm. in diameter.—Common everywhere in hill country. The dry fruits were used in early days as a substitute for the coffee bean.

2. **R. purshiana** DC. CASCARA SAGRADA. Small deciduous tree; leaves elliptic-oblong, thinnish, obtuse or blunt-pointed at apex, serrulate, mostly 7.2 to 14.4 cm. long; parts of the flowers in fives.—Mendocino Co. and n. to Wn. The bark furnishes the officinal drug Cascara, which is one of the most valuable of cathartics.

3. **R. crocea** Nutt. RED-BERRY. Low evergreen shrub 1 to 8 dm. high; branches slender, flexible; herbage glabrous; leaves often fascicled, narrowly elliptic, serrulate, green above, yellowish beneath, 2 to 8 mm. long; calyx-lobes and stamens 4; berry 4 to 6 mm. long.—Coast Ranges. Var. **ILICIFOLIA** Greene. Often tree-like, 14 to 28 dm. high; branchlets short and stout; leaves oval, 1.4 to 2 cm. long; calyx-lobes and stamens frequently 5. —Interior ranges mainly.

2. CEANOTHUS L. MOUNTAIN LILAC

Flowers in racemes, panicles or umbels. Calyx 5-lobed. Petals 5, hooded. Stamens 5, long-exserted. Style 3-cleft. Fruit sub-globose, 3-lobed, splitting into 3 valves. (Greek keanothus, name used by Dioscorides to designate some spiny plant.)

Leaves alternate; stipules deciduous; fruit smooth or crested; flowers in racemes or panicles.

Branches flexible, not spinescent.

Panicles mostly simple; leaves mostly pinnately nerved.

Branches terete; low or prostrate shrubs.

Leaf margin flat, leaves glossy above.....1. *C. foliosus*.

Leaf margin revolute.

Upper surface papillate all over; panicle oblong.....

2. *C. papillosus*.

Upper surface papillate on margin; panicle subglobose.....

3. *C. dentatus*.

Branchlets angular; tall shrubs or small trees.

Leaves strongly 3-nerved, plane.....4. *C. thyrsiflorus*.

Leaves pinnately veined, with revolute edges.....5. *C. parryi*.

Panicles large and compound; leaves mostly 3-nerved; tall shrub.....

6. *C. integerrimus*.

Branches rigid or spinescent.

Capsules mostly crestless; flowers white or blue.

Branchlets with greenish or brownish bark, flexible; spines slender, axillary, mostly leafless; leaves pinnately veined.....

7. *C. spinosus*.

Branchlets with whitish bark, rigid; leafless spines none; leaves 3-nerved.....

8. *C. divaricatus*.

Capsules crested.

Panicles simple, commonly cylindrical; branchlets not spiny or not markedly so; flowers blue.....9. *C. sorediatus*.

Panicles compound, not cylindrical; branchlets spiny; flowers white....

10. *C. incanus*.

Leaves usually opposite; stipules warty, persistent; fruit with a horn on each lobe; flowers in umbel-like clusters.

Leaves alternate or rarely opposite; flowers white.....11. *C. macrocarpus*.

Leaves opposite.

Leaves not revolute, usually entire.....12. *C. cuneatus*.

Leaves somewhat revolute, frequently dentate.

Lower surface of leaves tomentulose-areolate.....13. *C. jepsonii*.

Lower surface of leaves densely white-tomentose....14. *C. crassifolius*.

1. **C. foliosus** Parry. Low shrub with diffuse or horizontally spreading branches; leaves broadly oblong with smooth waxy surface and conspicuous glandular-serrate margin, 6 to 12 mm. long, frequently with smaller ones fascicled in the axils; racemes globose to oblong, 1.2 to 2.4 cm. long; flowers blue; pods smooth, conspicuously lobed, crested.—North Coast Ranges.

2. **C. papillosus** T. & G. Open shrub 11 to 17 dm. high; leaves oblong to linear, 1.2 to 5.4 cm. long, dark green above with glandular-papillate protuberances, pubescent or felt-like beneath; panicles cylindrical 1.2 to 4.2 cm. long; flowers blue; pod lobed and crested.—South Coast Ranges near the coast.

3. **C. dentatus** T. & G. Low dense shrub; leaves obovate or elliptical, becoming strongly or irregularly revolute, 6 to 10 (or 16) mm. long; panicles subglobose 1.2 to 3 cm. long; flowers blue; pods prominently crested.—Santa Cruz Mts. to Monterey.

4. **C. thrysiflorus** Esch. BLUE BLOSSOM. Shrub 11 to 43 dm. high; leaves green on both faces, elliptical or oblong-ovate, strongly 3-nerved beneath, serrulate, 2.4 to 6 cm. long; panicle 3.6 to 6.6 cm. long; flowers blue, rarely white; pod globose, smooth, little lobed.—Mountains near the coast.

5. **C. parryi** Trel. PARRY LILAC. Similar to no. 4; leaves oblong, pinnately veined, dark green above, loosely tomentose beneath, the margins revolute.—Mountains about Napa Valley.

6. **C. integerrimus** H. & A. DEER-BRUSH. Shrub 11 to 34 dm. high with slender branches and pliant branchlets; leaves ovate to oblong-ovate, entire, 1.8 to 4.8 cm. long, green above, lighter green below; panicles pyramidal, 7.2 to 12 cm. long; flowers commonly white; pod globose, somewhat lobed.—Sierra Nevada, Coast Ranges, S. Cal.

7. **C. spinosus** Nutt. Tall shrub; branchlets spine-like but slender; leaves elliptical, green above, drying brown beneath, 1.2 to 2.4 cm. long; panicle 2.4 to 7.2 cm. long; flowers pale blue; pod depressed, scarcely lobed, smooth, crestless.—Santa Barbara to S. Cal.

8. **C. divaricatus** Nutt. JACK-BRUSH. Shrub 14 to 40 dm. high with rigid divaricate branchlets; leaves ovate, entire or glandular-serrulate, glabrous above, puberulent beneath, 1.2 to 3 cm. long; panicles often long and narrow, 2.4 to 4.8 cm. long; flowers white or blue; pod little lobed, but very glandular.—Middle altitudes, foothills and mountains.

9. **C. sorediatus** H. & A. JIM-BRUSH. Shrub 11.5 to 20 dm. high with rigid divaricate branches; leaves ovate or elliptic-ovate, green above, paler beneath with appressed hairs, glandular-serrate, 8 to 30 mm. long; raceme ovate or broadly oblong, 1.2 to 2.4 cm. long; flowers blue or nearly white; pod lobed and crested.—Common in the Coast Ranges.

10. **C. incanus** T. & G. WHITE-THORN. Tall shrub, with glaucous branchlets; branchlets thick, stout and spur-like; leaves elliptical to ovate, dark brown above, strongly 3-nerved and pale beneath, 2.4 to 3.6 cm. long; flowers white, in a finely velvety raceme or panicle 3.6 to 7.2 cm. long; pod warty, lobed at top.—Coast Ranges.

11. **C. macrocarpus** Nutt. Shrub 17 to 34 dm. high, with very slender branches; leaves elliptic-obovate or cuneate, 1.2 to 2.4 cm. long, entire.

glabrous above, finely tomentose beneath; flowers white; umbels 1 to several on each short branchlet; pod not lobed, with diverging horns.—Mountains from Los Angeles to Santa Maria.

12. *C. cuneatus* Nutt. BUCK BRUSH. Rigid divaricately branched shrub 14 to 23 dm. high; bark gray; branchlets short and stout; leaves obovate or oblong-obovate, green above, paler beneath, 8 to 12 mm. (less commonly 24 mm.) long; pod with 3 short erect horns.—Abundant on mountain slopes, forming a large part of the chaparral in many places.

13. *C. jepsonii* Greene. Rigid shrub 11.5 to 14 dm. high; branchlets short, stubby, gray; leaves elliptic-oblong, spiny-toothed; flowers white or blue, exhaling a musky odor.—North Coast Ranges.

14. *C. crassifolius* Torr. Tall shrub; leaves thick, elliptic-obovate or oblong, green and glabrous above, densely white-tomentose beneath, finely toothed or entire, 1.8 to 2.4 cm. long; pod with 3 stout sub-erect horns near the top.—S. Cal.

MALVACEAE. MALLOW FAMILY

Herbs or shrubs with alternate leaves and regular flowers. Sepals 5, united at base and commonly subtended by an involucl of bractlets. Petals 5. Stamens numerous, united into a column. Pistil 1, superior, composed of several or many united carpels which either separate when ripe or form a single pod.—Species 800 to 900, distributed over the whole earth.

Fruit when ripe separating into separate carpels.

Styles stigmatic lengthwise on the inside; fruiting carpels 1-seeded, indehiscent.

Shrubs; bractlets united into a 2 to 3-lobed involucl, free from the calyx1. LAVATERA.

Herbs.

Bractlets 3, distinct, inserted on the calyx.....2. MALVA.

Bractlets none (rarely 1).....3. SIDALCEA.

Styles with terminal stigma; fruiting carpels 1 to 3-seeded, often splitting into 2 valves; bractlets slender or filiform.....4. MALVASTRUM.

Fruit a 3 to 5-celled capsule; style with terminal stigma; bractlets 3, large, leafy, heart-shaped5. GOSSYPIUM.

1. LAVATERA L.

Shrubs with maple-like leaves. Flowers showy, axillary, subtended by a 2 to 3-lobed involucl. Pedicels jointed above the middle. Petals reflexed after flowering, truncate or shallowly notched, long-clawed. Fruit a whorl of carpels. (One of the Lavater family of Zurich, at the time of Tournefort.)

1. *L. assurgentiflora* Kell. TREE MALLOW. Leaves palmately 5-lobed and toothed; petals rose-color.—Cult. as a hedge plant, especially near the coast as a wind-break for vegetable gardens.

2. MALVA L. MALLOW

Annual herbs. Flowers in axillary clusters. Calyx with an involucl of 3 distinct bractlets inserted on its base. Petals inversely heart-shaped or notched. Fruit a flattened whorl of carpels which separate from the central axis as kidney-shaped seed-like pieces. (Greek malache, soft, on account of the emollient properties.)

- Carpels not reticulate, puberulent on back; petals much surpassing the calyx.....
1. *M. rotundifolia*.
- Carpels rugose-reticulate on back.
Petals much surpassing the calyx; carpels glabrate at maturity, the margin entire or only obscurely denticulate; calyx-lobes mostly closed over the mature fruit.....2. *M. borealis*.
- Petals only slightly larger than the calyx; carpels pubescent on the back, the margin winged and denticulate; calyx-lobes spreading or erect.....
3. *M. parviflora*.

1. ***M. rotundifolia*** L. DWARF MALLOW. Stems procumbent; leaves round heart-shaped on very long petioles, crenate, obscurely lobed; petals whitish or pale blue.—Weed from Eur.

2. ***M. borealis*** Wallm. BULL MALLOW. Widely branching, 4.3 to 8.6 dm. high; pedicels tending to be reflexed in fruit; petals pinkish.—Weed from Eur.

3. ***M. parviflora*** L. CHEESE-WEED. Habit of no. 2; petals pinkish.—Weed from Eur. Very common in waste places and useful as a dry fodder when dead ripe.

3. **SIDALCEA** Gray

Herbs with rounded leaves. Flowers in terminal racemes or clusters, perfect or with staminate and pistillate flowers on different plants. Staminate flowers often with more or less imperfect pistil and pistillate flowers often with more or less imperfect stamens. Bractlets none (rarely 1). Stamen tube double. Fruit consisting of 5 to 9 carpels. (*Sida*, a genus of this family, and *Alkea*, ancient name for a mallow, alluding to the appearance and relationship of these plants.)

1. ***S. diploscypha*** (T. & G.) Gray. Erect annual 1.6 to 4.8 dm. high; basal leaves crenate, the upper more or less parted or divided; flowers in terminal clusters; petals truncated or merely retuse.—Valleys or low hills.

2. ***S. malvaeflora*** (Moc. & Sesse) Gray. CHECKER-BLOOM. Stems erect or ascending, several from a woody perennial root, 4 to 7 dm. high; leaves crenate or once or twice palmately cleft; raceme loose, 7 to 28 cm. long; flowers of 2 sorts on different plants, one perfect with large corollas, the other pistillate with smaller corollas; petals deeply emarginate.—Plains, valleys and low hills.

4. **MALVASTRUM** Gray. FALSE MALLOW

Herbs or shrubs, mostly hoary-pubescent or tomentose, with commonly angular leaves. Flowers commonly in narrowly paniculate racemes. Bractlets slender or filiform. Carpels 5 or more, 1 to 3-seeded, often splitting into 2 valves. (*Malva*, Mallow, and aster, disparaging Latin suffix, not genuine or true.)

1. ***M. fasciculatum*** (Nutt.) Greene. Shrub 1 to 2 m. high, with long slender wand-like branches; leaves round-ovate or somewhat heart-shaped, irregularly or obscurely lobed, crenate; calyx-lobes ovate, obtuse or with a very short point; petals rose-purple, 1.2 to 1.8 cm. long; carpels smooth, promptly splitting open.—Dry hills, cent. to S. Cal.

5. **GOSSYPIUM** L. COMMON COTTON

Herbs or shrubs. Styles united into one; stigmas 3 to 5. Seeds numerous, bearing cotton. (Ancient name of the cotton plant.)

Seeds covered with long and short hairs; flowers white, turning red.....

1. *G. hirsutum*.

Seeds covered with long hairs only; flowers yellow, turning red....

2. *G. barbadense*.

1. ***G. hirsutum*** L. UPLAND COTTON. Annual; leaves 5-lobed, the lobes short, rounded.—Cult., an important crop plant in the Colorado Desert (Imperial Co.); native of Mexico. The most commonly cultivated varieties are Lone Star, Durango, Acala and Mebane's Triumph. Production averages roughly per year about 1000 bales of 500 pounds each.

2. ***G. barbadense*** L. SEA-ISLAND COTTON. Leaves 5-lobed, the lobes ovate-lanceolate.—Less cult. than no. 1.; not known wild but probably native of the West Indies. Egyptian Cotton is another cultural strain of this species.

HYPERICACEAE. ST. JOHN'S WORT FAMILY

Ours herbs or the stems slightly woody at base. Leaves opposite, entire, glandular-dotted. Flowers perfect, regular. Sepals 5, persistent. Petals 5, yellow. Stamens numerous. Ovary superior; styles 3.—Species about 275, mostly temperate and tropical regions in all continents.

1. **HYPERICUM** L. ST. JOHN'S WORT

Leaves sessile. Flowers in terminal cymes, rarely solitary. (Ancient Greek name.)

1. ***H. concinnum*** Benth. GOLD-WIRE. Perennial; stems wiry, numerous, 1.4 to 2.6 dm. high; leaves linear to lanceolate, usually folded, 1.8 to 4.2 cm. long; petals black-dotted on the margins.—Foothills, rocky or brushy slopes. It is said to poison cattle, but the suspicion is not verified.

CISTACEAE. ROCK-ROSE FAMILY

Ours herb-like or woody at base. Flowers complete, regular. Sepals 5, persistent, unequal. Petals 5, ephemeral. Stamens indefinite. Ovary superior, 1-celled. Capsule 3-valved.—Species about 150, mostly north temperate regions, but represented in all continents save Australia.

1. **HELIANTHEMUM** Pers.

Leaves alternate, simple, entire. Flowers yellow, opening but once. Style short or none; stigma 3-lobed. (Greek helios, sun, and anthemion, blossom.)

1. ***H. scoparium*** Nutt. RUSH-ROSE. Stems in a rush-like tuft, 1.9 to 4.8 dm. high, ending in short racemes; leaves linear, 2 to 3 cm. long; corolla 1 to 1.5 cm. broad.—Dry slopes and ridges of the chaparral belt.

VIOLACEAE. VIOLET FAMILY

Herbs with basal or alternate stipule-bearing leaves and axillary nodding flowers. Sepals 5. Corolla irregular. Petals 5, one of them spurred. Stamens 5, conniving about the pistil. Style single. Ovary 1-celled, becoming a pod which splits into 3 valves.—About 300 species of wide distribution.

1. **VIOLA** L. VIOLET

Peduncles 1-flowered. Sepals with ear-like lobes at base. Lower petal

spurred at base. Two lower stamens bearing spurs which project into the spur of the corolla. Style club-shaped. (Old Latin name used by Virgil.)

Leaves divided or parted.

Leaves pinnately twice-parted; petals orange-yellow, the two upper brownish externally1. *V. douglasii*.

Leaves palmately cleft or divided; petals yellow, purple externally.....2. *V. lobata*.

Leaves undivided

Flowers yellow.

Stems prostrate, stolon-like3. *V. sarmentosa*.

Stems erect

Peduncles 3.6 cm. long, mostly shorter than the leaves.....

4. *V. glabella*.

Peduncles surpassing the leaves.

Peduncles 9.6 to 12 cm. long; leaves round-ovate, usually with truncate base5. *V. pedunculata*.

Peduncles 4.8 to 9.6 cm. long; leaves rhombic-ovate to oblong....

6. *V. purpurea*.

Flowers not yellow.

Lateral and lower petals white or yellow with a deep purple spot at base; leaves triangular-ovate.....7. *V. ocellata*.

Petals blue or violet (rarely white); leaves round-ovate.....8. *V. canina*.

1. ***V. douglasii*** Steud. Leaves all basal, arising from a deeply seated short rootstock, bipinnatifid into narrow segments; peduncles 4.8 to 12 cm. long, equaling or exceeding the leaves; petals orange-yellow, brownish on the outside, the others purple-veined, the lateral beardless.—Open hillsides.

2. ***V. lobata*** Benth. PINE VIOLET. Stems erect, naked below, 9.6 to 33.6 cm. high; leaves ovate or roundish, cordate at base, palmately 3 to 5-cleft or -divided, 2.4 to 4.8 cm. long; petals yellow, purple on the outside.—Woods, often under Yellow Pine.

3. ***V. sarmentosa*** Dougl. WOOD VIOLET. Stems prostrate, stolon-like, sparsely leafy; leaves ovate-cordate, 1.2 to 3 cm. broad, mostly shorter than the peduncles; petals uniform light yellow.—Woods.

4. ***V. glabella*** Nutt. Stems from a short fleshy rootstock, erect, slender, naked or sparingly leafy below, 1.6 to 2.8 dm. high; leaves kidney-shaped or cordate, 3.6 to 9 cm. broad, the basal on petioles 9.6 to 26.4 cm. long, the upper on petioles 8 to 12 mm. long; peduncles about 3.6 cm. long; petals bright yellow, more or less purple-veined.—Wet places in woods.

5. ***V. pedunculata*** T. & G. YELLOW PANSY. Peduncles erect, 9.6 or 12 cm. long, much surpassing the leaves, borne on very short stems which arise from a thick and short deeply seated rootstock; leaves round-ovate, truncate at base, crenate, 1.2 to 3 cm. long, on petioles 2.4 to 4.8 cm. broad; petals golden yellow, the upper dark brown on the outside, the others purple-veined within, the lateral bearded.—Open hills.

6. ***V. purpurea*** Kell. MOUNTAIN VIOLET. Plants tufted, 7.2 to 14.4 cm. high, the stem very short; leaves 1.8 to 3 cm. long; petals yellow, brownish-purple on the outside.—Mountain ridges.

7. ***V. ocellata*** T. & G. WESTERN HEARTSEASE. Stems from creeping rootstocks, erect, 12 to 28.8 cm. high; leaves cordate-triangular or ovate, 2.4 to 6 cm. long, the basal long-petioled, the upper short-petioled; stipules

small, scarious; peduncles shorter than the leaves; upper petals white within, the others white or yellow with purple markings at base.—Shady woods.

8. *V. canina* L. var. *adunca* Gray. DOG VIOLET. Stems leafy, 4.8 to 9.6 cm. high; leaves broadly ovate, often cordate at base, obscurely crenate, 1.8 cm. to 3.6 cm. long; stipules green, cut-toothed; petals violet-purple, or rarely white, the lateral ones bearded on the upper side at base; spur as long or much shorter.—Vicinity of the coast.

LOASACEAE. LOASA FAMILY

Herbs with either rough or stinging hairs and often white deciduous bark. Leaves in ours alternate. Flowers regular. Calyx-tube adnate to the ovary, its limb 5-lobed. Petals 5. Stamens usually numerous. Ovary 1-celled; placenta 2 or 3, parietal. Fruit a capsule.—Species about 120, mostly in S. Am.

1. MENTZELIA L.

Ours erect annuals or biennials. Leaves coarsely toothed or pinnatifid, in age brittle, adhering tightly to clothing by means of barbed hairs. Flowers terminal, solitary or cymose, small or showy. Fruit dehiscent at the summit. (C. Mentzel, a German botanist of the 17th century.)

Biennial; capsule oblong; seeds flat, winged.....1. *M. laevicaulis*.
Annual; capsule linear or clavate; seeds cylindrical or angular, wingless.....
2. *M. gracilentia*.

1. *M. laevicaulis* (Dougl.) T. & G. BLAZING STAR. Stem stout, whitish, 5.7 to 10 dm. high; leaves narrowly oblong to lanceolate, sinuate-toothed, 7.2 to 16.8 cm. long; flowers light yellow, 7.2 to 9.6 cm. broad; petals broadly oblanceolate.—Dry gravelly stream beds.

2. *M. gracilentia* T. & G. Stems green, 1 to 4.3 dm. high; flowers clustered at the summit; petals yellow, 8 to 12 mm. long; filaments dilated and somewhat united at base.—Los Angeles Co. to Monterey Co.

CUCURBITACEAE. GOURD FAMILY

Annual or perennial herbs with simple leaves. Corolla sympetalous, 5 to 7-lobed. Calyx-lobes about 5 or obsolete. Staminate flower with 3 stamens. Pistillate flower with an inferior 1 to 6-celled ovary and 2 or 3 stigmas. Fruit gourd-like, or dry and splitting open.—About 637 species, especially in the tropics.

Flowers large, staminate and pistillate on separate peduncles; seeds flattened.

Both kinds of flowers solitary in the axils.

Corolla bell-shaped; seeds mostly margined.....1. CUCURBITA.

Corolla rotately expanded; seeds marginless.....2. CITRULLUS.

Staminate flowers clustered, the pistillate ones solitary in the axils.....

3. CUCUMIS.

Flowers small, the staminate in racemes, the pistillate solitary; seeds large, thick..

4. ECHINOCYSTIS.

1. CUCURBITA L. GOURD

Stems prostrate, trailing and vine-like, scabrous. Flowers large, yellow.

low, solitary. Filaments distinct. Fruit a smooth globose gourd. (Classical name.)

Plant annual.

Leaves lobed; stalks of fruits strongly ridged.....1. *C. pepo*.
Leaves not lobed; stalks of fruits not strongly ridged.....2. *C. maxima*.

Plant perennial.

Leaves triangular-ovate; fruit 3-celled, its pedicel without thickened ridges....
3. *C. foetidissima*.
Leaves palmately 5-cleft; fruit 5-celled, its pedicel with thickened ridges at
summit4. *C. palmata*.

1. **C. pepo** L. PUMPKIN. Stems long-running; leaves 3 to 5-lobed; corolla-tube widening upwards, the lobes erect; fruit various in form, color, size.—Native of America, cultivated by the Indians before the time of Columbus. It is not known in a wild state. (Cf. De Candolle, Origin of Cultivated Plants.)

2. **C. maxima** Duch. SQUASH. Stems long-running; leaves orbicular or kidney-shaped; corolla-lobes large, widely spreading or drooping; fruit rounded, ovate, or pointed, smooth.—Cult., native country unknown.

3. **C. foetidissima** H. B. K. CALABAZILLA. Stems 14 to 43 dm. long; leaves triangular-cordate or sub-cordate, 9.6 to 19 cm. long; calyx-tube 1.2 cm. long; corolla 7.2 to 9.6 cm. long; gourd 7.2 to 9.6 cm. in diameter.—S. Cal. to the San Joaquin Valley. The roots are used by Spanish-Californians as a cleanser and whitener of clothing, the leaves medicinally.

4. **C. palmata** Wats. MOCK ORANGE. Stems a few m. long; leaves palmately 5-cleft; calyx-tube 3.4 cm. long; gourd 7.2 cm. in diameter.—S. Cal. to the San Joaquin Valley.

2. CITRULLUS Forsk.

Annual or perennial climbing or trailing herbs. Leaves alternate, round-cordate, deeply 3 to 5-lobed. Flowers pale yellow, solitary. Stamens cohering by their anthers. Fruit large, fleshy, with hard rind. Seeds imbedded in the pulpy placentæ. (Diminutive of Latin citrus, citron.)

1. **C. vulgaris** Schrad. WATERMELON. Stems prostrate; pulp of fruit edible, consisting of the enlarged pulpy placentæ, reddish or rarely white.—Cult. from trop. Africa.

3. CUCUMIS L. MELON

Climbing or trailing annual herbs. Leaves large, alternate, entire or palmately lobed or dissected. Staminate flowers in clusters. Pistillate flowers solitary in the axils. Stamens distinct. Fruit a pepo. (Old Latin name.)

1. **C. melo** L. MUSKMELON. Stems long-running, hairy; leaves soft-hairy, large, round-cordate or reniform, sometimes rounded-lobed; fruit smooth at maturity, pubescent or glabrous, with sweet flesh.—Cult. from s. Asia. Var. **INODORUS** Naud. Winter Melon. Leaves lighter colored, less hairy; fruit with little or no odor.—Cult. Var. **RETICULATUS** Naud. Nutmeg Melon. Fruits with softer rind, more or less netted on the surface, with muskmelon odor.—Cult. Var. **CANTALUPENSIS** Naud. Canta-

loupe. Fruits mostly hard rinded, more or less warty, scaly or rough with muskmelon odor.—Cult.

2. **C. sativus** L. CUCUMBER. Stems long-running, prickly, strongly angled; fruit prickly or muricate, mostly oblong.—Cult. from s. Asia.

4. **ECHINO CYSTIS** T. & G. BIG ROOT

Trailing or climbing herbs with large globose or fusiform roots, branched tendrils and thin leaves. Flowers small, greenish or white, the staminate in axillary racemes or panicles, the pistillate solitary in the axils. Calyx-teeth very small or obsolete. Corolla rotate or campanulate. Fruit prickly, bursting irregularly. Seeds large, ovoid or oblong. (Greek echinos, a hedgehog, and kustis, a bladder, in reference to the spiny fruit.)

Corollas rotate or somewhat saucer-shaped; staminate racemes mostly with many to numerous flowers; spines more or less puberulent.

Pistillate flowers without abortive stamens; corolla dull or greenish-white; fruit globose1. *E. fabacea*.

Pistillate flowers with abortive anthers; corolla probably clear white; fruit oblong2. *E. macrocarpa*.

Corollas campanulate; staminate racemes relatively few-flowered; spines puberulent or sometimes glabrous; fruit ovate or globose-ovate, commonly long-beaked3. *E. oregana*.

1. **E. fabacea** Naud. COMMON MAN ROOT. Stems 1 to 8 m. long; leaves round-cordate, rather deeply 5 to 7-lobed; flowers dull or greenish white; fruit globose; seeds 4.—Hills and valleys.

2. **E. macrocarpa** Greene. Similar to no. 1 but fruit ovoid or oblong, 9.6 to 12 cm. long, 12 to 14-seeded.—S. Cal.

3. **E. oregana** Cogn. HILL MAN ROOT. Flowers pure white; fruit pointed at both ends, sparingly spiny.—Hills about San Francisco Bay and n.

CRASSULACEAE. STONE-CROP FAMILY

Succulent herbs. Leaves in ours entire, without stipules. Flowers in cymes or rarely solitary, small, regular, usually perfect. Sepals, petals and pistils usually 5 in ours, and the stamens usually 5 or 10. Petals somewhat perigynous, distinct or united below into a tube. Fruit a follicle. Receptacle with a nectar-bearing scale behind each pistil.—Species about 600, of wide distribution.

Leaves opposite; stamens as many as the petals; diminutive annuals....1. TILLAEA.
Leaves alternate; stamens twice as many as the petals; perennials; flowering stems from basal rosettes.

Petals commonly spreading, at least at tip; mostly mat-like plants with branching rootstocks2. SEDUM.

Petals commonly erect often closely approximate at tip; coarse plants with thick basal leaf rosettes borne on a simple or branched caudex.....

3. COTYLEDON.

1. **TILLAEA** L.

Tiny annuals. Flowers very small, in the leaf axils. Sepals, petals, stamens and carpels usually 4. Petals distinct or nearly so. (Michael Angelo Tilli, Italian botanist.)

1. **T. erecta** H. & A. Flowers clustered in the axils; petals and sepals subequal; carpels 1 to 2-seeded.—Dry commonly sandy ground.

2. **SEDUM** L. STONE-CROP

Flowers yellow or white or reddish-tinged, borne in a cyme. Petals 5, distinct or a little united at the base. Stamens 10. (Latin *sedeo*, to sit, on account of the lowly habit.)

1. ***S. spatulifolium*** Hook. Leaves spatulate, often glaucous; rosettes close, flat; cyme mostly flat-topped; carpels erect.—Shaded moss-covered rocks in the foothills.

3. **COTYLEDON** L. LIVE-FOR-EVER

Flowering stems with reduced or scale-like leaves. Leaves of the rosette thick and fleshy. Flowers in cymes. Petals white, yellow, orange or reddish, united at base or below the middle. Stamens 10, borne on the corolla-tube. (Greek *kotule*, a shallow cup, referring to the rosettes.)

Rosettes very large (1.4 to 1.9 dm. wide), borne on a stout caudex 4.8 to 14.4 cm. high; plant densely white-mealy; leaves 4.8 to 6 cm. wide.....

1. *C. pulverulenta*.

Rosettes medium-sized (1.2 to 7.2 cm. wide), borne at the ground; plants white-glaucous to green; leaves 6 to 36 mm. wide.

Pedicels stout, shorter than the flowers; flowers yellow; rosettes globose, very compact2. *C. farinosa*.

Pedicels slender, equaling or exceeding the flowers.

Flowers yellow or orange, sometimes turning reddish in age....3. *C. laxa*.

Flowers reddish from the first.....4. *C. lanceolata*.

1. ***C. pulverulenta*** (Nutt.) B. & W. CHALK-LETTUCE. Plants 7.2 to 11.5 dm. high; flowers red, narrow.—Dry rocky slopes, 20 to 2000 ft., sea-bluffs or mostly near the sea: Los Angeles Co. to San Diego Co.

2. ***C. farinosa*** Baker. Leaves rather thick; inflorescence compact; flowers on very short stout pedicels.—Rocky points and bluffs along the ocean shore, Monterey Co. to Del Norte Co.

3. ***C. laxa*** (Lindl.) B. & W. ROCK-LETTUCE. Leaves relatively thin-nish; cyme somewhat loose; pedicels slender.—Rocky ground, 1100 to 4000 feet, just back of the sea coast and east across the Coast Ranges to the Sierra Nevada foothills.

4. ***C. lanceolata*** (Nutt.) B. & W. DESERT SAVIOR. Branches of the cyme commonly few, the flowers often rather few relatively.—Rocky ground, 100 to 4000 ft.; Santa Barbara Co. to San Diego Co. The watery-fleshy leaves are chewed to assuage thirst in the desert.

SAXIFRAGACEAE. SAXIFRAGE FAMILY

Shrubs or perennial herbs. Calyx 5-lobed or -cleft. Petals 5. Stamens commonly 5 or 10. Ovary more or less attached to the calyx, or free from it. Fruit a capsule or berry.—About 700 species, widely distributed.

Herbs; fruit a pod; leaves alternate or basal.

Ovary 2 or 3-celled (or the carpels nearly distinct): placentæ axile.....

1. SAXIFRAGA.

Ovary 1-celled; placentæ parietal.

Stamens 10; petals mostly toothed.....2. TELLIMA.

Stamens 5; petals entire.....3. HEUCHERA.

Shrubs.

Leaves opposite; fruit a dry pod; low trailing shrubs.....4. WHIPPLEA.

Leaves alternate; fruit a berry; mostly erect shrubs.....5. RIBES.

1. **SAXIFRAGA** L. SAXIFRAGE

Perennial herbs with the leaves in a basal cluster, and the flowers on a scape-like peduncle. Calyx either free from or attached to the base of the ovary. Petals entire. Stamens 10. Styles 2. Pod 2-celled, 2-beaked, or the 2 carpels almost distinct. (Latin saxum, a rock, and frango, to break.)

1. **S. californica** Greene. Leaves elliptic, serrate, undulate, 1.2 to 4.8 cm. long; flowers white; calyx-lobes ovate, reflexed; petals roundish, often notched, 3 mm. long.—Hill country in rocky places.

2. **TELLIMA** R. Br.

Perennial herbs with tuber-like rootstocks. Stems simple, bearing a simple terminal raceme of white, pink or red flowers. Leaves chiefly basal. Calyx campanulate or turbinate, the lower part of tube attached to lower part of ovary. Petals inserted in sinuses of calyx, cleft or toothed, rarely entire. Stamens 10. Ovary 1-celled. Styles 2 or 3, short. Pod conical. (Name an anagram of *Mitella*.)

Styles commonly 3; petals with claws, white or pinkish.

Lower half of ovary adherent; calyx-tube turbinate.....1. *T. affinis*.

Ovary almost wholly free; calyx-tube truncate or rounded at base.....

2. *T. heterophylla*.

Styles commonly 2; petals sessile, greenish-white, changing to red.....

3. *T. grandiflora*.

1. **T. affinis** (Gray) Boland. STAR OF BETHLEHEM. Stems 2 to 3.8 dm. high; basal leaves roundish, crenately lobed; upper 3-parted, the divisions incised or toothed; racemes about 7 to 10-flowered; petals mostly 3-toothed.—Open ground.

2. **T. heterophylla** H. & A. Similar to no. 1; calyx campanulate; petals with a stout tooth on each side.—Shady ground.

3. **T. grandiflora** (Pursh.) Dougl. FRINGE-CUPS. Stems 1 to 7 dm. high; leaves roundish, cordate at base, shallowly 3 to 5-lobed, serrate or crenate, 4.8 to 9.6 cm. broad; raceme many-flowered; calyx inflated-campanulate, 8 to 10 mm. long; petals laciniate-pinnatifid.—Moist woods near the coast, Santa Cruz Co. and n.

3. **HEUCHERA** L. ALUM ROOT

Perennial herbs with stout rootstocks. Leaves basal, round-cordate, lobed. Stems scape-like, bearing a panicle of small white flowers. Calyx-tube adnate to lower half of ovary. Petals clawed, entire. Stamens 5. Pod 1-celled, 2-beaked. (J. H. Heucher, 1677-1747, a German professor of medicine.)

1. **H. micrantha** Dougl. Plants 2.8 to 8.6 dm. high; herbage hairy; inflorescence glandular-puberulent; leaves round- or ovate-cordate, obtusely lobed, crenate, 4.8 to 9.6 cm. long, on long petioles; flowers in an ample loose panicle; pedicels longer than the flowers; calyx turbinate at base, 2 mm. long; petals, stamens and styles exerted.—Near the coast, Monterey Co. and n.

4. **WHIPPLEA** Torr.

Slender trailing undershrub with opposite leaves and clusters of small white flowers on a terminal naked peduncle. Calyx-tube adnate to lower part of ovary. Stamens 10 (8 to 12). Ovary 3 to 5-celled. Pod split-

ting into 3 to 5 one-seeded portions. (Lieut. A. W. Whipple, commander of the Pacific Railroad Expedition from the Mississippi River to Los Angeles in 1853 and 1854.)

1. **W. modesta** Torr. Leaves ovate or oval-ovate, crenate above the middle, 1.8 to 4.2 cm. long, short-petioled; clusters 4 to 9-flowered, the flowers soon turning greenish; petals oblong or ovate, exceeding 2 mm.; pod globose.—Coast Range woods.

5. RIBES L.

Shrubs with alternate palmately lobed leaves. Flowers in racemes or solitary, the pedicels with bractlets. Calyx-lobes, petals and stamens commonly 5. Calyx-tube adnate to the 1-celled ovary and commonly produced beyond it. Styles 2, distinct or partly united. Fruit a berry. (Ancient Arabic name.)

Stems unarmed; raceme many-flowered; berry spineless.—CURRANTS.

Flowers pink or red; leaves pubescent or tomentulose below.

Style glabrous; leaves thinnish.....1. *R. sanguineum*.

Style pubescent; leaves thickish.....2. *R. malvaceum*.

Flowers greenish-white; leaves resinous-dotted below.....3. *R. bracteosum*.

Stems thorny and often prickly; raceme mostly 1 to few-flowered.—GOOSEBERRIES.

Flowers 5-merous; petals much shorter than calyx-lobes.

Petals plane; stems spiny; berry unarmed.....4. *R. divaricatum*.

Petals involute; berry prickly.

Stems prickly.

Leaves glabrous or nearly so and non-glandular; ovary with mostly equal non-glandular bristles5. *R. californicum*.

Leaves mostly pubescent and mostly glandular below; ovary with long and short more or less gland-tipped bristles....

6. *R. menziesii*.

Stems not prickly7. *R. amarum*.

Flowers 4-merous, showy; petals as long as calyx-lobes.....8. *R. speciosum*.

1. **R. sanguineum** Pursh. FLOWERING CURRANT. Erect or straggling shrub 1.4 to 2.5 m. high; herbage more or less glandular-pubescent; leaves round-cordate, shallowly lobed, finely serrate; racemes erect, 2.4 to 7.2 cm. long with spatulate or obovate colored bracts; pedicels with 2 caducous bractlets at apex; calyx red or reddish, 1.2 cm. long; petals white changing to deep red; stamens and style not surpassing the petals; berry blue-black, with bloom, sparingly glandular-hirsutulose.—High montane. Var. **GLUTINOSUM** B. & W. Racemes drooping.—In cañons or northward slopes near the coast.

2. **R. malvaceum** Smith. More strictly erect and compact shrub; leaves conspicuously rugulose; racemes usually erect; ovary white-hairy; berry-pulp sweet.—Dry interior hills.

3. **R. bracteosum** Dougl. STINK CURRANT. Stems 1 to 2.3 m. high; herbage almost glabrous; leaves round-cordate in outline, deeply 5 to 7-lobed, doubly serrate, 7.2 to 24 cm. broad, long-petioled; racemes slender, erect or ascending, 4.8 to 12 cm. long; calyx above ovary rotate or saucer-shaped, without distinct tube; petals less than 2 mm. long; berry black, resinous-dotted.—Mendocino Co. and n.

4. **R. divaricatum** Dougl. STRAGGLY GOOSEBERRY. Straggling shrub 11.5 to 17 dm. high; spines at the nodes 1 (or 3); leaves roundish, palmately 3 to 5-cleft, the lobes incised and serrate; racemes drooping; pedicels slender, 1.2 cm. long; sepals broadly oblong, green without, dull

purple within; petals white, fan-shaped; stamens and style long-exserted, the latter cleft, villous at the middle.—Shaded cañons and flats.

5. **R. californicum** H. & A. HILLSIDE GOOSEBERRY. Compact shrub with rigid flexuous branches, 7 to 11.5 dm. high; leaves roundish, truncate at base, incisely lobed and serrate, the upper surface glandular-shining, 1.2 to 1.8 cm. broad; pedicels with two bractlets at middle; flowers mostly solitary; calyx greenish; petals white; ovary with mostly equal non-glandular bristles.—Open hillsides, middle Cal.

6. **R. menziesii** Pursh. CAÑON GOOSEBERRY. Loosely branched shrub 1 to 2 m. high; stems prickly as well as spiny, especially on sterile shoots; leaves similar to no. 5 but rather larger; pedicels 1 or 2-flowered, the bractlets near the flower; calyx purplish; petals white; ovary with long and short more or less gland-tipped bristles.—Coast Ranges.

7. **R. amarum** McCl. Similar to *R. menziesii* but the stems not prickly; ovary densely covered with short gland-tipped bristles; berry with more or less glandular spines.—Mountains of S. Cal.

8. **R. speciosum** Pursh. Tall evergreen shrub 11 to 28 dm. high; stems prickly or almost smooth; leaves small, coriaceous, nearly evergreen, roundish-elliptic to obovoid, roundish at base, slightly 3-lobed; peduncles 1 or 2-flowered; flowers crimson; calyx-tube short, forming a swollen ring; stamens exserted; berry very bristly.—Near the coast from Santa Clara Co. to Monterey and San Diego.

PLATANACEAE. PLANE FAMILY

Trees with large alternate palmately lobed leaves. Buds concealed in the hollow base of the petiole. Bark falling away in thin plates. Flowers small, greenish, in dense ball-like heads, the staminate and pistillate in separate heads, monœcious. Fruit a nut.—Species 6 or 7, in the n. temperate zone.

1. PLATANUS L. PLANE TREE

The only genus. (Greek *platus*, broad, referring to the ample leaves.)

1. **P. orientalis** L. ORIENTAL PLANE. Tree 11 to 23 m. high with comparatively short trunk; leaves 3 to 5-lobed, broadly cuneate at base, 9.6 to 19.2 cm. long, glabrous, the lobes dentate or sinuate; heads terminal on the branches of a drooping axis.—Cult. from the Levant. A superior street tree, especially in the south coastal belt.

2. **P. racemosa** Nutt. WESTERN SYCAMORE. Tree 8 to 28 m. high, often leaning; leaves 3 to 5-lobed, usually cordate or truncate, thick, and firm, tomentose, 1 to 3 dm. long, the lobes usually entire; heads sessile, scattered along a single slender drooping axis.—Stream bottoms in dry country.

ROSACEAE. ROSE FAMILY

Herbs, shrubs or trees. Leaves alternate, stipulate. Calyx 5-lobed. Petals 5 (rarely none). Stamens 10 to numerous, inserted with the petals on the calyx below its lobes. Pistils 1 to many, distinct and free from the calyx, or united into a 2 to 5-celled ovary which is partly or completely inferior. Fruit a pod, achene, pome, or berry-like.—The Rose Family is a

large one, consisting of 2000 species, found in all continents but natives chiefly of the temperate or cold climates of the northern hemisphere. From an economic standpoint it is one of the leading families on account of the great number of edible fruits which it produces. It also contains a large number of ornamentals as well as plants yielding medicines and fragrant oils. No member of this family is poisonous or unwholesome.

A. Ovary superior.

Fruit dehiscent, consisting of 2 to 5 dry pods or follicles; shrubs.—MEADOW SWEET TRIBE.

Pods inflated, 2 to 4-seeded, dehiscent.....1. *PHYSOCARPUS*.

Pods not inflated, 1-seeded, tardily dehiscent or indehiscent....2. *HOLODISCUS*.

Fruit indehiscent; shrubs or herbs.

Ovary becoming an achene or drupelet.—ROSE TRIBE.

Pistils more than 1; leaves compound or pinnately lobed.

Pistils becoming drupelets; fruit called a "berry".....3. *RUBUS*.

Pistils becoming dry achenes.

Pistils not disposed on the inside of a large globose receptacle; receptacle conic.

Receptacle fleshy; leaves 3-foliolate.....4. *FRAGARIA*.

Receptacle dry; leaves pinnate or palmate....5. *POTENTILLA*.

Pistils disposed on the inside of a globose or urn-shaped calyx-tube; fruit termed a "hip".....6. *ROSA*.

Pistil only one; leaves simple.

Achene with long feathery tail; petals none.....7. *CERCOCARPUS*.

Achene not tailed; petals white.....8. *ADENOSTOMA*.

Ovary becoming a drupe; trees or shrubs with simple leaves and caducous stipules.—CHERRY TRIBE.

Pistils 5; drupes 1 to 5; flowers dioecious.....9. *OSMARONIA*.

Pistil 1; drupe solitary; flowers perfect.....10. *PRUNUS*.

B. Ovary inferior; fruit a pome; trees and shrubs with simple leaves.—APPLE TRIBE.

Foliage evergreen; flowers small, numerous, in a panicle: fruit bright red, berry-like11. *HETEROMELES*.

Foliage deciduous.

Flowers in corymbs.

Fruit a 2 to 5-celled pome with 2 seeds in each cell.....12. *PYRUS*.

Fruit a 5-celled pome with many seeds in each cell.....13. *CYDONIA*.

Flowers several in a raceme; fruit berry-like.....14. *AMELANCHIER*.

1. PHYSOCARPUS Maxim.

Diffuse shrubs with reddish shreddy bark. Leaves simple. Flowers white, in corymbs terminating leafy branchlets. Petals rounded. Stamens 20 to 24. Pistils 1 to 5, becoming inflated pods. (Greek *phusa*, bellows or bladder, and *karpos*, fruit.)

1. *P. capitatus* (Pursh) Ktze. NINE BARK. Leaves roundish or ovate, 3-lobed, irregularly serrate, 2.4 to 4.8 cm. long or more; stamens alternately long and short.—Along streams or on steep cañon sides.

2. HOLODISCUS Maxim.

Shrubs with toothed or lobed leaves. Stipules none. Flowers small, creamy white, numerous, in terminal panicles. Petals rounded. Stamens 20. Pods 5, hairy, 1-seeded. (Greek *holo*, whole or complete, and *diskos*, a disk.)

1. *H. discolor* (Pursh) Maxim. CREAM BUSH. About 8 to 17 dm. high; leaves ovate to ovate-elliptic, whitish beneath, coarsely serrate or

incised above the entire base, 1.8 to 7.2 cm. long; panicle in flower often half-drooping; flowers 3 mm. long.—Wooded cañons.

3. RUBUS L.

Erect trailing or climbing bushes. Leaves simple or pinnate. Stamens numerous. Pistils many, crowded on an elevated receptacle, becoming drupelets which are united to each other and form the fruit called a berry. (Latin name, allied to *ruber*, red.)

Berry conical or hemispherical and concave beneath (the drupelets parting from the receptacle as a whole).

Stem unarmed; flowers white; leaves simple.....1. *R. parviflorus*.

Stem prickly, particularly sterile shoots; leaves compound.

Flowers red; leaves pubescent or silky beneath, deciduous; berry red or yellow.....2. *R. spectabilis*.

Flowers white; leaves white-tomentose beneath, evergreen; berry black or red.....3. *R. leucodermis*.

Berry broadly oblong, the drupelets persistent on the receptacle; flowers white; leaves mostly with 3 to 5 leaflets, or a few simple.....4. *R. vitifolius*.

1. ***R. parviflorus*** Nutt. THIMBLE-BERRY. Stems 8.6 to 20 dm. high; leaves circular in outline, palmately 5 to 7-lobed, 7.2 to 16.8 cm. broad; flowers in corymbs, 2.4 to 4.2 cm. broad, variable in the number of sepals and petals; calyx-lobes ovate, terminated by a foliaceous appendage; petals elliptic; berry red, low-hemispherical.—Cañon streams near the coast.

2. ***R. spectabilis*** Pursh. SALMON-BERRY. Stems 8.6 to 25 dm. high; leaves 3-foliolate; leaflets ovate, doubly serrate, more or less lobed, 2.4 to 4.8 cm. long; flowers 1 to 3 in a cluster; petals 1.2 cm. long; berry large, red or yellow.—Margins of woods and along streams, near the coast. Var. **MENZIESII** Wats. Leaves pubescent or silky beneath.—Cent. Cal. coast.

3. ***R. leucodermis*** Dougl. WESTERN RASPBERRY. Stems long and straggling, armed with short recurved prickles; herbage glaucous; leaflets 3, ovate to ovate-lanceolate, doubly serrate, green above, white with a close tomentum beneath, 1.8 to 4.8 cm. long; flowers few in a corymb, 1.2 cm. broad; berry black or red.—Mountains.

4. ***R. vitifolius*** C. & S. CALIFORNIA BLACKBERRY. Fig. 2. Stems low and erect, or long and trailing or climbing; leaves pinnately 3 to 5-foliolate (with ovate doubly

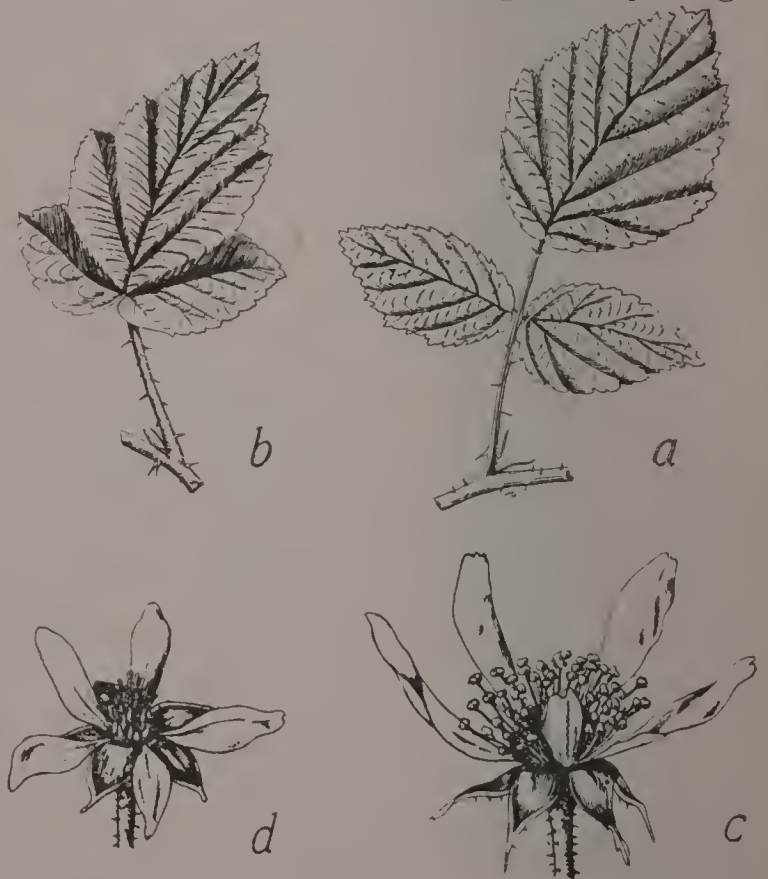


Fig. 2. *Rubus vitifolius* C. & S. a, compound leaf $\times \frac{1}{3}$; b, simple leaf $\times \frac{1}{3}$; c, fl. with stamens $\times 1$; d, fl. with pistils $\times 1$.

serrate leaflets 1.8 to 6 cm. long) or some of the leaves simple and ovate or palmately lobed; petals 1.2 to 1.8 cm. long; berry black.—Along streams.

4. **FRAGARIA** L. STRAWBERRY

Perennial herbs propagating by runners. Leaves in a basal tuft, 3-foliolate, the leaflets cuneate-obovate and serrate. Flowers white, borne in cymes on a naked stem. Calyx bearing 5 bractlets (simulating sepals) alternate with the calyx-lobes. Petals roundish, short-clawed. Pistils numerous, becoming seed-like achenes borne on the enlarged succulent receptacle, the whole popularly termed a "berry." (Name in reference to the fragrance of the berry.)

1. **F. californica** C. & S. WOOD STRAWBERRY. Plants 1 to 1.4 dm. high; herbage pilose; leaves thin, light green, never with evident reticulate veining; petals 6 to 8 mm. long; berry globose; achenes borne on the surface of the receptacle.—Coast Range woods.

2. **F. chilensis** Duch. SAND STRAWBERRY. Plants 2.4 to 9.6 cm. high; herbage hairy except the upper surface of the leaves; leaves thick, dark green, with evident reticulate veining; petals 8 to 12 mm. long; achenes sunk in pits on the receptacle.—Sandhills along the coast.

5. **POTENTILLA** L. FIVE FINGER

Perennial or woody-based herbs with compound leaves and serrate or cleft leaflets. Flowers white or yellow, in terminal cymes. Calyx with bractlets as in *Fragaria*. Stamens 10 to many. Pistils many or numerous, borne on an elevated dry receptacle, becoming achenes. (Diminutive of the Latin *potens*, powerful, some species used medicinally.)

Stamens 20 to 25; filaments filiform; petals yellow.

Leaves white-silky beneath; creeping herb.....1. *P. anserina*.

Leaves green on both faces; stems erect.....2. *P. glandulosa*.

Stamens 10 in 2 rows; filaments dilated; petals white.

Petals erect or nearly so; calyx-tube deeply cup-shaped.....3. *P. californica*.

Petals spreading rotately; calyx-tube saucer-shaped or cupulate....4. *P. lindleyi*.

1. **P. anserina** L. SILVER WEED. Stems slender, prostrate, the leaves and peduncles in a basal tuft, crowning the thick root; leaves pinnate, white-silky beneath; leaflets 7 to 21, with smaller ones between; petals rounded, much exceeding the calyx.—Marshy or springy places along the coast or in the mountains.

2. **P. glandulosa** Lindl. Plants 2.8 to 8.6 dm. high; leaves pinnate; leaflets 5 to 7, broadly ovate or obovate, cuneate at base, 2.4 to 7.2 cm. long; cyme lax; flowers small; petals pale yellow, scarcely equaling the calyx.—Wooded hills.

3. **P. californica** (C. & S.) Greene. Stems stoutish, erect, 2.8 to 8.6 dm. high; leaflets 9 to 21, cuneate-obovate to oblong, 1.2 to 4.2 cm. long; cyme dichotomously forked; petals about equalling the calyx; filaments opposite the calyx-lobes, subulate, the others filiform or nearly so.—Wooded slopes or edge of brushy thickets, Coast Ranges from Humboldt Co. to Monterey Co.

4. **P. lindleyi** Greene. Stems erect or ascending, 1.6 to 4.8 dm. high; leaves mostly basal; leaflets roundish to cuneate-obovate, 8 to 14 mm.

long; cymes rather crowded; petals obtuse, $\frac{1}{3}$ longer than sepals; alternate filaments larger.—Coast, Santa Cruz Co. to Santa Barbara Co.

6. ROSA L. ROSE

Shrubby prickly plants with pinnate leaves and adnate stipules. Flowers large, ours mostly pink, solitary or corymbose. Calyx-tube globose or urn-shaped, becoming fleshy in fruit and termed a "hip." Petals rounded, inserted with the numerous stamens on the edge of the thin disk which lines the calyx-tube and bears toward the base the many pistils. Pistils becoming achenes. (The Latin name.)

Prickles slender and straight or none; calyx-lobes at length deciduous from the hip; flowers small1. *R. gymnocarpa*.
Prickles stout, recurved; calyx-lobes persistent on the hip; flowers large.....2. *R. californica*.

1. ***R. gymnocarpa*** Nutt. WOOD ROSE. Slender bush, 2.8 to 8.6 dm. high, glabrous; leaflets 5 (or 3), elliptic, 6 to 18 mm. long, doubly serrate, the minute teeth gland-tipped; flowers solitary (or in clusters of 2 or 3); corolla 14 to 20 mm. broad; hips ovate or pear-shaped, 8 to 14 mm. long.—Wooded cañons.

2. ***R. californica*** C. & S. CALIFORNIA WILD ROSE. Stoutish shrub 8.6 to 17 dm. high; prickles mostly in pairs below the leaves; leaflets 5 or 7, ovate or elliptic, 1.8 to 3.6 cm. long; flowers in corymbs; corolla 2.4 to 3 cm. broad; hips ovate-globose, 1.2 cm. long.—Stream banks or moist valleys.

7. CERCOCARPUS H. B. K.

Shrubs with the flowers solitary or in clusters on short branchlets. Calyx-tube slender and stalk-like, surmounted by the low-hemispherical calyx-limb which is at length deciduous. Petals none. Stamens numerous, in 2 or 3 rows. Pistil 1, with a long style. Fruit an achene, enclosed in the calyx-tube and bearing the twisted tail-like soft-hairy style. (Greek kerkis, a shuttle, and karpos, fruit, in reference to the achene and its twisted tail.)

Leaves cuneate-obovate, toothed; flowers 2 to 5 in a cluster.....1. *C. betuloides*.
Leaves narrowly lanceolate, obovate, entire; flowers solitary or in pairs.....2. *C. ledifolius*.

1. ***C. betuloides*** Nutt. MOUNTAIN MAHOGANY. Shrub or small tree, 1 to 4 m. high; leaves half leathery, serrate above the middle, conspicuously feather-veined; calyx-tube in fruit 1.2 cm. long, reddish-brown, contracted above; achene leathery, the tail 7.2 long or less.—Middle and high elevations in the mountains.

2. ***C. ledifolius*** Nutt. DESERT MAHOGANY. Shrub or small tree, 2 to 5 m. high; leaves coriaceous, glabrous above at maturity, pubescent below, 1.2 to 2.4 cm. long, veins obscure.—Desert slopes. The wood is very hard and close-grained and is used for tool handles and machine bearings.

8. ADENOSTOMA H. & A.

Shrubs with somewhat resinous herbage. Leaves linear, rigid, entire, small, numerous and mostly in clusters. Flowers small, white, disposed in a panicle of racemes. Calyx 10-ribbed. Petals rounded. Stamens 10 to 15. Pistil 1. Ovary 1-celled. Fruit an achene. (Greek aden, gland, and stoma, mouth, in allusion to the calyx.)

1. **A. fasciculatum** H. & A. CHAMISE. Plants 6 to 28 dm. high, the virgate branches clothed with leaf clusters; leaves 6 to 10 mm. long.—Gregarious and exclusively occupying extensive slopes and mountain ridges.

9. OSMARONIA Greene

Shrubs with simple entire leaves. Stipules caducous. Flowers white, fragrant, in nodding racemes terminating leafy branchlets, the pistillate and the staminate on separate plants. Petals erect in the pistillate flower, spreading in the staminate. Stamens 15, in 3 rows. Pistils 5, becoming drupes. (Osme, Greek adjective meaning fragrant, and Aronia, a genus founded by Persoon and now referred to Amelanchier.)

1. **O. cerasiformis** (T. & G.) Greene. OSO BERRY. Shrub 8.6 to 25 dm. high; leaves glabrous, broadly oblong, acute at each end, 3.6 to 6 cm. long when mature; petals 4 to 6 mm. long; drupes 1 to 5, blue-black, bitter.—Coast Range hills.

10. PRUNUS L.

Trees or shrubs with simple serrate leaves. Flowers white or pink, in clusters. Calyx deciduous after flowering. Stamens 15 to 30. Pistil 1, becoming a globose, ovoid or oblong drupe. (The Latin name of the plum.)

Leaves conduplicate in the bud.

Drupe soft-hairy or downy; stone furrowed or pitted.

Flowers white; fruit with dry flesh.....1. *P. communis*.

Flowers pink; fruit with thick edible flesh.....2. *P. persica*.

Drupe glabrous, without bloom; stone globose, smooth.

Flowers in short corymbs or lateral clusters.

Tree; pulp of drupe not bitter.....3. *P. avium*.

Shrub; pulp of drupe bitter.....4. *P. emarginata*.

Flowers in racemes.

Peduncle leafy; drupe small; its flesh astringent; foliage deciduous....

5. *P. demissa*.

Peduncle leafless; drupe large, its flesh sweetish; foliage evergreen....

6. *P. ilicifolia*.

Leaves convolute in the bud; stone compressed, smooth or nearly so; flowers white.

Flowers in clusters; drupe with a bloom.

Tree; leaves ovate or obovate, 4.8 to 7.2 cm. long.....7. *P. domestica*.

Shrub; leaves round to ovate, 1.8 to 4.8 cm. long.....8. *P. subcordata*.

Flowers solitary or in twos; fruit pubescent or glabrous.....9. *P. armeniaca*.

1. **P. communis** Frit. ALMOND. Tree; leaves lanceolate, closely serrate; fruit with a dry flesh which at length separates from the softish stone.—Cult. from Asia. The more important horticultural varieties in Cal. are Nonpareil, Ne Plus Ultra and I X L.

2. **P. persica** Sieb. & Zucc. PEACH. Tree; leaves broadly or oblong lanceolate, serrate; stone deeply pitted and very hard.—Cult. from Persia, some of the commoner varieties being the Alexander, Crawford, Muir, Salway, Foster and McKeivitt Cling.

3. **P. avium** L. COMMON CHERRY. Tree; leaves ovate or obovate, short-pointed, glossy above; drupe roundish.—Cult. from Eur. The most common varieties are Black Tartarian, Royal Ann and Napoleon Bigarreau.

4. **P. emarginata** Dougl. BITTER CHERRY. Shrub 1 to 3 m. high;

leaves oblong-obovate or ovate, 1.8 to 3.6 cm. long; blade with 1 or 2 glands just above junction with petiole; flowers in short corymbs; drupe bright red.—Hills and mountains.

5. *P. demissa* Nutt. CHOCHE CHERRY. Slender shrub 1.5 to 4 m. high; leaves 2.4 to 7.2 cm. long; petioles with 1 or 2 glands near summit; flowers in racemes 4.8 to 9.6 cm. long; drupe red or dark purple.—Hills and mountains.

6. *P. ilicifolia* Nutt. ISLAY. Evergreen shrub 2 to 5 m. high; leaves elliptic or ovate, 2.4 to 4.8 cm. long; flowers 4 mm. long; drupe red or dark purple, 12 to 16 mm. thick.—Oakland Hills to S. Cal.

7. *P. domestica* L. COMMON PLUM. Tree; leaves ovate or obovate, coarsely serrate, usually pubescent beneath, 4.8 to 7.2 cm. long; fruit various, but mostly globular or oblong.—Cult. from southwestern Asia. The commoner varieties are the Tragedy, Clyman, Wickson, Burbank, Greengage and Golden Drop.

8. *P. subcordata* Benth. SIERRA PLUM. Shrub 1 to 2 m. high; leaves round to ovate, 5 cm. long or less; flowers 2 to 4 in a cluster; petals obovate, 8 mm. long; drupe dark red, 1.8 to 2.4 cm. long; pulp rather hard but edible.—Hills and mountains.

9. *P. armeniaca* L. APRICOT. Tree with reddish bark; leaves ovate to round-ovate, abruptly short-pointed, serrate; petioles gland-bearing; flowers nearly sessile; fruit when ripe separating from the short stalk; stone free, ridged and channeled on one edge.—Native of China, common in cult. The commoner horticultural varieties are Royal, Pringle, Newcastle, Blenheim and Moorpark.

11. HETEROMELES Roem.

Evergreen shrub with simple leathery serrate leaves. Flowers numerous, small, white, in a terminal panicle. Stamens 10, in pairs. Pistils 2, lightly united and lightly adhering to the fleshy calyx-tube. Fruit a bright red berry-like ovoid pome. (Greek heteros, different and melon, an apple.)

1. *H. arbutifolia* (Lindl.) Roem. CHRISTMAS BERRY. Shrub 1 to 4 m. high; leaves oblong, acute at each end, 4.8 to 9.6 cm. long; corolla 5 mm. broad.—Mountain and hillsides and along streams. Large quantities of the fruiting branchlets with their crimson berries are used in Christmas decoration. The Spanish-Californians called the shrub Tollon.

12. PYRUS L. PEAR. APPLE

Trees or shrubs with simple leaves and white or pink flowers in corymbs. Fruit a 2 to 5-celled pome with 2 seeds in each cell. (The Latin name of the pear.)

1. *P. communis* L. COMMON PEAR. Tree, the branchlets inclined to be thorny; leaves ovate, with small obtuse teeth; flowers white; fruit tapering to base.—Cult. from southern Europe and Asia. The most common variety is the Bartlett.

2. *P. malus* L. COMMON APPLE. Tree; buds, lower surface of leaves (when young) and calyx woolly; leaves ovate or oblong, serrate; flowers white, tinged with pink; fruit globose, sunken at both ends.—Cult. from Europe and grown in numerous forms. Of the 40 commercial varieties

of fruits in the United States, the apple is the most common and extensively cultivated. The crop is about 250 million bushels a year.

13. **CYDONIA** Miller. QUINCE

Shrub or small tree with simple entire leaves and white or pink flowers. Fruit a 5-celled many-seeded pome. (The fruits known to the Romans as *Mala cydonia*, apples from Cydon, now Canea in Crete.)

1. **C. vulgaris** Pers. QUINCE. Shrub or small tree with slender spineless branches; leaves oval or oblong, entire, pubescent beneath; fruit large, yellow, pyriform or globular.—Cult. from Persia.

14. **AMELANCHIER** Medic. SERVICE BERRY

Shrubs with simple leaves and white flowers in racemes. Calyx-tube attached to the ovary. Stamens about 20. Ovary 5-celled. Styles 5. Fruit a berry-like globose pome, the cells 1-seeded. (Savoy name of the medlar.)

1. **A. alnifolia** Nutt. JUNE BERRY. Shrub 2 to 4 m. high; leaves elliptic, serrate near the apex; petals broadly oblong or cuneate at base, 10 mm. long; fruit purplish.—Hillsides, very showy in flower.

LEGUMINOSAE. PEA FAMILY

Herbs, shrubs or trees with alternate stipulate leaves, in our species commonly compound. Calyx 5-toothed or -cleft or 2-lipped. Corolla with 5 petals, highly irregular and butterfly-like, the upper petal is called the banner, the two lateral petals are the wings, and the two lower petals coherent by their edges form the keel. Stamens 10, united into 1 set (monadelphous), or 2 sets of 9 and 1 (diadelphous), sometimes distinct. Ovary 1-celled, becoming a 2-valved pod or legume.

This family, with about 7,000 species, is the third largest family of flowering plants. It is widely distributed in all continents, especially in the temperate and tropical zones, and is of the greatest economic importance on account of the large number of useful plants which it contains. For variety of product no other order has so great a claim upon our attention. *Phaseolus vulgaris* L. (Bean) and *Pisum sativum* L. (Pea) produce important foods. *Trifolium pratense* L. (Red Clover), *T. repens* L. (White Clover), *Medicago sativa* L. (Alfalfa), *Vicia sativa* L. (Vetch) are invaluable fodder plants. *Indigofera tinctoria* L. (Indigo) is the most important of all vegetable dyes. *Acacia senegal* Willd. yields Gum Arabic. The bark of *Acacia arabica* L. is a powerful tonic. *Dalbergia latifolia* Roxb. is East Indian Rosewood, while *Haematoxylon campechianum* L. is the Logwood,—both valuable timbers. Thousands of other useful plants belong to this family. Probably all the species bear nodules on their roots which assist in taking up free nitrogen.

- Flowers regular1. ACACIA.
- Flowers more or less irregular.
 - Leaves simple; corolla only slightly irregular.....2. CERCIS.
 - Leaves compound; corolla strongly irregular.
 - Calyx 5-toothed.
 - Stamens monadelphous or diadelphous.
 - Flowers not in umbels.
 - Leaflets more than 3.

- Leaves unequally pinnate, that is the rachis ending in a leaflet; leaflets many; flowers in racemes, spikes or heads.
 Herbs; pods often inflated; stipels none..... 11. *ASTRAGALUS*.
 Trees; pods flat, never inflated; leaflets with stipels. 10. *ROBINIA*.
- Leaves equally pinnate, the rachis ending in a tendril or point; herbs.
 Lobes of the calyx foliaceous; style hairy down the inner side15. *PISUM*.
 Lobes of the calyx not leafy.
 Style hairy down the upper side..... 14. *LATHYRUS*.
 Style hairy only at summit.....13. *VICIA*.
- Leaflets 3; herbs.
 Leaves palmately 3-foliolate; flowers in a head or head-like cluster; corolla withering-persistent..... 7. *TRIFOLIUM*.
- Leaves pinnately 3-foliolate; flowers in racemes or spikes; corolla deciduous after flowering.
 Leaflets with stipels.....16. *PHASEOLUS*.
 Leaflets without stipels.
 Leaves glandular-dotted; perennial herbs..... 9. *PSORALEA*.
 Leaves not glandular-dotted.
 Pods small, globose; annuals or biennials.... 6. *MELILOTUS*.
 Pods spirally coiled or curved; annuals or perennial herbs.....5. *MEDICAGO*.
- Flowers in umbels or solitary; leaves equally or unequally pinnate, the leaflets 3 to many, sometimes 1 or 2; herbs.... 8. *LOTUS*.
 Stamens distinct; flowers solitary; very spiny shrub..3. *PICKERINGIA*.
- Calyx 2-lipped.
 Flowers in racemes or spikes, mostly in whorls; leaves palmate, with 4 to many leaflets.....4. *LUPINUS*.
 Flowers in axillary heads or spikes; leaves pinnate with 4 leaflets..... 12. *ARACHIS*.

1. *ACACIA* Willd.

Trees or shrubs with leaves bipinnate or reduced to phyllodia. Flowers yellow or straw-color, in spikes, heads, solitary or in clusters. Corolla regular. Stamens separate, numerous. Pod various. (The ancient Greek name.)

Leaves reduced to phyllodia.

Flowers in globular heads.

Veins of phyllodia 11. *A. armata*.

Veins of phyllodia more than 2..... 2 *A. melanoxyton*.

Flowers in spikes; phyllodia whorled.....3. *A. verticillata*.

Leaves all bipinnate.

Pinnae few, 2 to 3 pairs.....4. *A. baileyana*.

Pinnae many, 8 to 15 pairs.....5. *A. decurrens*.

1. *A. armata* R. Br. KANGAROO THORN. Spreading shrub 2 to 3 m. high; phyllodia half-ovate, nerve ending in a point; pods hairy, straight or slightly curled.—Cult. from Austr.

2. *A. melanoxyton* R. Br. AUSTRALIAN BLACKWOOD. Tree; phyllodia oblanceolate to lanceolate, 6 to 10.8 cm. long, with 3 to 6 parallel nerves; flowers in short racemes of 3 to 5 heads; pods reddish-brown, twisted, 7.2

to 12 cm. long; seed encircled by double fold of a long red funicle.—Cult. from Austr. It yields a valuable timber.

3. **A. verticillata** Willd. WHORL-LEAF ACACIA. Shrub or small tree; phyllodia in whorls or scattered, linear-subulate, 12 to 15 mm. long; flowers in spikes; pods flat, 2.4 to 7.2 cm. long.—Cult. from Austr.

4. **A. baileyana** F. v M. Shrub or small tree with abundant gray foliage; leaves alternate, compound, 2.4 to 4.8 cm. long; pinnae 2 to 3 pairs; leaflets about 20 pairs; flowers in racemes; pod 3.6 to 9.6 cm. long.—Cult. from Austr.

5. **A. decurrens** Willd. GREEN WATTLE. Tree with more or less prominently angled branches; leaves compound; pinnae 8 to 15 pairs; leaflets about 30 to 40 pairs, linear; flowers in heads; pods 7.2 to 9.6 cm. long, more or less constricted between the seeds.—Cult. from Austr. Its bark is a valuable tanning agent. Var. **MOLLIS** Lindl. Black Wattle. Tree 5 to 14 m. high with reddish bark showing under fissures; pinnae 8 to 15 pairs, dark green, shining on upper surface; leaflets many, imbricately crowded; flowers pale yellow, blooming in June; pods pubescent.—Cult. from Austr. Var. **DEALBATA** F. v M. Silver Wattle. Tree, 14 m. or more high with smooth bark and gray-pubescent branchlets; leaves silver-gray to light green; leaflets less crowded or discrete; flowers deep yellow; pods smooth.—Cult. from Austr.

2. **CERCIS** L. JUDAS TREE

Shrubs with simple round-cordate leaves and red-purple flowers in fascicles. Corolla only slightly irregular. Stamens 10, distinct. Pod oblong, very flat, the upper suture with a winged margin. (Kerkis, Greek name of the oriental Judas Tree.)

1. **C. occidentalis** Torr. RED-BUD. Stems clustered, 2.5 to 2.8 m. high; leaves 6 to 7.2 cm. broad.—Foothills.

3. **PICKERINGIA** Nutt.

Very rigid and spiny evergreen shrub. Leaves palmately 1 to 3-foliolate, without stipules. Flowers large, purple, axillary, solitary. Stamens distinct. (Charles Pickering of the Wilkes Expedition which visited California in 1841.)

1. **P. montana** Nutt. PEA CHAPARRAL. Densely branched, 1 to 2 m. high; flowers 1.8 cm. long.—Dry mountain slopes.

4. **LUPINUS** L.

Herbs or low shrubs. Leaves palmate with 4 to 15 leaflets. Flowers showy, in terminal racemes or spikes. Calyx deeply 2-lipped. Banner roundish, the sides mostly reflexed. Wings commonly connivent by their edges in front of and thus inclosing the keel. Stamens monadelphous, the anthers alternately oblong and rounded. (Latin lupus, wolf, these plants thought to rob the soil of its fertility.)

By CHARLES PIPER SMITH.

Cotyledons sessile, connate; ovules usually 2 only; annuals.....1. *L. densiflorus*.
Cotyledons petioled after germination; ovules 2 to 12 or none.

Plants annual or biennial.

Flowers whorled.

Keel ciliate on both upper and lower margins near the claw only;
upper calyx-lip bifid, lower entire or tridentate.....

2. *L. succulentus*.

- Keel non-ciliate, or ciliate on upper margins near apex only.
- Pedicels 3 to 8 mm. long; flowers 8 to 16 mm. long; verticils few to several; upper calyx-lip cleft, lower bi- or tridentate; seeds 2 to 3 mm. long..... 3. *L. nanus*.
- Pedicels 1 to 3 mm. long; upper calyx-lip cleft, lower tridentate. Banner neither cuneate nor spatulate; keel slender. Pods 6 to 9 mm. wide; seeds 4 to 5 mm. long..... 4. *L. pachylobus*.
- Pods 3 to 5 mm. wide; seeds 2 to 3 mm. long..... 5. *L. bicolor*.
- Banner cuneate or spatulate; keels short and broad; seeds 3 mm. long6. *L. micranthus*.
- Flowers not verticillate-whorled; keel ciliate on lower margins near claws.
- Racemes longer than peduncles; upper lip of calyx cleft, lower entire or tridentate, but see no. 9.
- Longest leaflets 15 to 25 mm. wide; plant with stinging hairs..... 7. *L. hirsutissimus*.
- Largest leaflets 2 to 15 mm. wide.
- Keel stout, with blunt acumen, densely ciliate on upper edge8. *L. truncatus*.
- Keel with slender acute acumen.....9. *L. sparsiflorus*.
- Racemes usually shorter than peduncles; upper calyx-lip bifid, lower entire10. *L. stiversii*.
- Plants perennial; pedicels slender, 3 to 12 mm. long; floral bracts usually early deciduous.
- Keel not ciliate.
- Shrubs or sub-shrubs; upper calyx-lip cleft, lower entire.
- Tall shrubs; leaves all short-petioled.....13. *L. chamissonis*.
- Low sub-shrubs with long petioles at flowering time..... 14. *L. albifrons*.
- Herbaceous; leaves silky-pubescent above; calyx-lips notched or entire, 6 to 10 mm. long..... 15. *L. formosus*.
- Keel ciliate on upper margins.
- Keel ciliate from the claws to about the middle; upper calyx-lip notched, about 4 mm. long, lower entire, about 6 mm. long; herb11. *L. latifolius*.
- Keel ciliate from near apex to the middle; upper calyx-lip notched or retuse, 6 to 8 mm. long, lower entire; tall shrub..... 12. *L. arboreus*.

1. ***L. densiflorus*** Benth. Plant 2 to 5 dm. high, simple or branched; leaves long-petioled, glabrous above; racemes 15 to 25 cm. long, the whorls 5 to 12; flowers 14 to 18 mm. long, spreading during and after anthesis; upper calyx-lip short, scarious, lower lip much longer, green; petals lilac or rose; banner elliptic; keel ciliate on upper edges; pods ovate-oblong.—San Francisco Bay Region.

2. ***L. succulentus*** Dougl. Fig. 3. Plant 2 to 6 dm. high, stout, branched; leaves long-petioled, glabrous above; racemes 6 to 30 cm. long; flowers 12 to 17 mm. long, approximate in 4 to 8 whorls, spreading in anthesis, ascending later; petals deep blue to almost white, the banner with yellow center turning violet; keel somewhat curved; pods about 5 cm. long.—Butte Co. to S. Cal.

3. ***L. nanus*** Dougl. Plant erect, 2 to 6 dm. high, simple or branched; leaves long-petioled; racemes 6 to 20 cm. long; verticils well separated; bracts deciduous; petals rich blue, rarely pink, the banner with white or yellow center changing to violet; pods appressed-pubescent, 20 to 35 mm. long; ovules usually 4 to 8; seeds 2 to 3 mm. long.—Coast Ranges; Sierra foothills.

4. *L. pachylobus* Greene. Plant 1 to 3 dm. high, stout; racemes of 2 to 4 whorls; flowers few, 6 to 8 mm. long; petals blue, banner suborbicular, 6 to 8 mm. wide, with a white center; pods especially large, 25 to 30 mm. long, 6 to 8 mm. wide.—Grassy hills.

5. *L. bicolor* Lindl. var. *microphyllus* C. P. Smith. Plant 1 to 4 dm. tall; flowers 4 to 12 mm. long; keel ciliate; ovules 5 to 8; banner elliptic to orbicular-ovovate; pods 15 to 20 mm. long, 3 to 5 mm. wide.—Low hills and valleys.

6. *L. micranthus* Dougl. Plants 1 to 4 dm. tall; leaves glabrous or sparsely hairy above; racemes 1 to 8 cm. long, the whorls 2 to 7; flowers 5 to 8 mm. long; petals blue and white; banner cuneate or spatulate, the center turning violet, the sides scarcely reflexing; keel short and broad; pods 25 to 30 mm. long; seeds oblong, thick.—Commonly abundant.

7. *L. hirsutissimus* Benth. Plants 2 to 6 dm. high, hirsute with nettle-like stiff hairs; racemes 10 to 25 cm. long with scattered flowers; flowers 13 to 15 mm. long, spreading; upper calyx-lip cleft, lower entire or tridentate; petals violet or lilac; banner suborbicular; keel stout, straight; pods 25 to 35 mm. long, very hirsute.—San Mateo Co. to S. Cal.

8. *L. truncatus* Nutt. Plants 3 to 6 dm. high, branched; leaves many, glabrate, the petioles flattened; racemes 6 to 15 cm. long, lax and few-flowered; flowers 10 to 12 mm. long, spreading or drooping after anthesis; bracts usually persistent; upper lip of calyx bifid, lower entire or tridentate; petals violet or paler purple; pods spreading, about 3 cm. long, villous.—Monterey to S. Cal.

9. *L. sparsiflorus* Benth. Plants 2 to 4 dm. high, slender; leaves hairy or glabrate above; racemes 8 to 20 cm. long; flowers 8 to 13 mm. long, spreading in anthesis; bracts villous, deciduous; petals bright blue or purplish, the banner with a yellow spot; keel curved; pods ascending, 12 to 18 mm. long.—S. Cal.



Fig. 3. *Lupinus succulentus* Dougl.; a. fl. branchlet $\times \frac{1}{4}$; b, upper calyx-lip; c, lower calyx-lip; d, banner; e, wing; f, keel. $\times 1$.

10. *L. stiversi* Kellogg. Plants 15 to 45 cm. high, the branches ascending; leaves long-petioled, appressed-pubescent both sides; racemes 1 to 3 cm. long, few-flowered; flowers about 15 mm. long; banner bright yellow, the wings rose-pink or purple; keel nearly straight; pods about 20 mm. long; seeds flat, angled.—Sierra Nevada; San Bernardino Mts.

11. *L. latifolius* Agardh. Plants 6 to 12 dm. high; leaves largest near the middle of the stem; petioles and leaflets 4 to 10 cm. long, the latter 10 to 30 mm. wide; racemes 15 to 45 cm. long, rather lax; flowers 10 to 14 mm. long, whorled or scattered; bracts early deciduous; calyx minutely bracteolate; petals blue or purple, rarely yellowish, fading brown; banner suborbicular, glabrous; wings truncate or incurved on lower free margin, the keel somewhat exposed; pods dark brown, about 3 cm. long by 6 to 8 mm. wide.—Humboldt Co. to Los Angeles Co.

12. *L. arboreus* Sims. TREE LUPINE. Branching shrub with a distinct trunk or rarely low and caespitose, 4 to 24 dm. high; racemes 10 to 30 cm. long; flowers 14 to 18 mm. long, scattered or whorled; petals broad, commonly bright yellow, but sometimes lilac, blue, or violet; banner suborbicular, glabrous; keel curved; pods dark brown, 5 to 8 cm. long by 8 to 12 mm. wide.—Coastal sands and cañons, Humboldt Co. to Santa Barbara Co.

13. *L. chamissonis* Esch. Erect branching shrub 3 to 9 dm. high; leaves many, silky on both sides; racemes 6 to 15 cm. long; flowers 12 to 16 mm. long, scattered or subverticillate; petals blue or lavender, the banner with a yellow center, pubescent on the back near apex; keel arcuate; pods brown.—San Francisco to Los Angeles Co.

14. *L. albifrons* Benth. Somewhat tree-like shrub 6 to 15 dm. high; herbage appressed silvery-silky; leaves many; leaflets 7 to 10; racemes 8 to 30 cm. long; flowers 10 to 14 mm. long, whorled; bracts early deciduous; petals blue or purplish, the banner more or less pubescent on the back near the apex, with white or yellow center early changing to violet; keel narrowed toward the base; pods dull yellow, 3 to 5 cm. long, about 8 mm. wide.—Coast Ranges.

15. *L. formosus* Greene. Plants 3 to 8 dm. tall; racemes 10 to 25 cm. long; flowers usually whorled, 12 to 16 mm. long; petals rich purple, blue, lilac or white; banner suborbicular, 11 to 14 mm. wide; keel slender; pods silky, 30 to 35 mm. long.—Butte Co. to San Diego Co.

5. **MEDICAGO** L. MEDICK

Herbs. Leaves pinnate with 3 leaflets. Flowers small, in racemes or short spikes on axillary peduncles. Stamens diadelphous (9 and 1). Pod small, 1 to several-seeded, not splitting open, incurved, coiled or spirally twisted. (Greek Medike, name given by Dioscorides to a plant from Media, perhaps lucern.)

1. *M. sativa* L. ALFALFA. Perennial; herbage glabrous or slightly pubescent; leaflets oblong-obovate or linear-oblong, 1.2 to 2.4 cm. long; flowers blue, 1 cm. long, disposed in racemes; pod spirally twisted into 2 or 3 coils.—Cult. It is a native of western Asia and has been cultivated for 20 centuries. Brought to California in 1854, it is our "King of Forage Plants," often producing ten tons of hay per acre each year. As a

bee plant it is also esteemed, sometimes yielding 60 pounds of honey to the acre.

2. **M. hispida** Gaertn. BUR CLOVER. Branches spreading or procumbent; herbage nearly glabrous; leaflets obovate or obcordate; peduncles 3 to 5-flowered; flowers yellow, small; pod compressed, twisted into a close spiral of 2 or 3 turns, the keeled edge with a double row of curved or hooked prickles.—Common naturalized plant, native of Eur. It is highly valued as a dry fodder on the ranges in the long rainless summers of California.

6. MELILOTUS Hill. SWEET CLOVER

Annual or biennial herbs. Leaves pinnate with 3 leaflets. Flowers small, yellow or white, erect in the bud, deflexed in anthesis, disposed in spike-like racemes on axillary peduncles. Pod ovoid, leathery, wrinkled, 1 to 2-seeded. (Greek meli, honey, and lotus, the ancient name for some plant belonging to this family.)

1. **M. alba** Desr. WHITE MELILOT. Stem branching above, 8 to 17 dm. high; leaflets oblong, serrate except at the very base; flowers white, 4 mm. long.—River beds or moist valleys; nat. from Eur. It is cultivated for fodder, though animals do not take kindly to it at first.

2. **M. indica** All. YELLOW MELILOT. Stem branching, 4 to 8 dm. high; leaflets cuneate-obovate, serrate, except at base, retuse at apex; flowers yellow.—Nat. from Eur. It is cultivated as a cover plant for green manure, and has a secondary value as forage.

7. TRIFOLIUM L. CLOVER

Herbs. Leaves palmate, commonly with 3 leaflets. Flowers in a head or very short spike. Stamens in 2 sets (9 and 1). Pod 1 to 6-seeded. (Latin tres, three, and folium, leaf.)

Heads not subtended by an involucre.

Flowers nearly or quite sessile; annuals.

Heads pedunculate, elongate-ovate, small.....1. *T. albobiprurpureum*.

Heads large, globose.....2. *T. dichotomum*.

Flowers pediceled, at length reflexed.

Annuals.

Plant strictly glabrous.

Calyx-teeth with ciliated margins.....3. *T. ciliatum*.

Calyx-teeth with entire, not ciliated margins.....4. *T. gracilentum*.

Plant pubescent on the petioles and peduncles; leaflets bifid.....

5. *T. bifidum*.

Perennials.

Plant small; calyx glabrous; flowers cream color.....6. *T. repens*.

Plant large.

Calyx sparsely pubescent; flowers tinged with pink.....

7. *T. hybridum*.

Calyx hairy; flowers rose-red.....8. *T. pratense*.

Heads subtended by an involucre; annuals.

Corolla not becoming inflated.

Involucre cup-shaped, not deeply lobed; flowers developing equally all around.

Lobes of involucre toothed.....9. *T. microdon*.

Lobes of involucre entire.....10. *T. microcephalum*.

Involucre flat, rather deeply lobed, the lobes laciniately toothed; flowers commonly blooming earlier on one side, and the heads therefore one-sided; herbage mostly glabrous.

Margins of involucre lobed but not toothed; calyx-teeth dilated.....

11. *T. tridentatum*.

Margins of involucre lobed and toothed; calyx-teeth not dilated.

Flowers small, enclosed within 1 or 2 involucre.....
12. *T. variegatum*.

Flowers large, each floral whorl subtended by an involucre.....
13. *T. involucreatum*.

Corolla conspicuously inflated in age, the petals withering-connivent by their tips and forming a bladder-like sac to the growing pod.

Involucre large, lobes lanceolate.....14. *T. fucatum*.

Involucre small, lobes obtusely rounded.....15. *T. amplexens*.

Involucre reduced to a ring.....16. *T. depauperatum*.

1. ***T. albopurpureum*** T. & G. Stems ascending or erect, 9.6 to 33 cm. high; leaflets oblong-obovate, denticulate toward the apex; heads ovate, 6 to 16 mm. high, on long slender peduncles; corolla purple, white-tipped.—Lower hills.

2. ***T. dichotomum*** H. & A. Similar to no. 1; stems dichotomously branching; heads cylindrical, 1.6 to 2 cm. long, mostly with turbinate base.—Hills at middle altitudes.

3. ***T. ciliatum*** Benth. JAYBIRD CLOVER. Plants erect, 2 to 4 dm. high, glabrous; leaflets cuneate-oblong to obovate, serrulate, 1 to 2.4 cm. long; flowers whitish or purplish; calyx-teeth lanceolate, rigidly ciliate; pod 1-seeded.—Plains, valleys and low hills.

4. ***T. gracilentum*** T. & G. PIN-POINT CLOVER. Plants erect, 2.4 to 3.8 dm. high, wholly glabrous; rachis often prolonged through heads as a sterile point; corolla reddish or deep purple, the ends of the petals more or less white-tipped; pod 2-seeded.—Valleys and low hills.

5. ***T. bifidum*** Gray. Plants slender, pale green and glaucous, glabrous, or hairy only on the petioles and peduncles; leaflets linear to obovate, bifid at apex, with a mucro in the notch; flowers pale pink; pod 1-seeded.—Hills and valleys. Var. *DECIPIENS* Greene. Leaflets less notched; calyx often hairy.

6. ***T. repens*** L. WHITE CLOVER. Plant low, creeping; leaves long-petioled; leaflets obcordate and obscurely toothed; heads long-peduncled from the ground; flowers white.—Lawns and pastures; cult. from Eur.

7. ***T. hybridum*** L. ALSIKE CLOVER. Stems ascending or nearly erect, 2.8 to 8.6 dm. high; leaflets obovate, serrulate; heads small, loose, nearly globular; flowers rose-color, or white on top of head.—Moist lands, nat. from Eur.

8. ***T. pratense*** L. RED CLOVER. Stems ascending, 3 to 4 dm. high; somewhat hairy; leaflets oval or obovate, sometimes notched at the end, marked with a large spot; heads globular, ovate, sessile; flowers red-purple.—Cult. from Eur.

9. ***T. microdon*** H. & A. Stems stoutish, erect or decumbent; herbage faintly pubescent; leaflets broadly obcordate, serrulate, 1.2 cm. long; heads 8 mm. broad; involucre 12 to 15-lobed, the lobes 3 to several-toothed and spreading abruptly from the head after the flowering period; corolla white, fading pinkish.—Valleys and plains.

10. ***T. microcephalum*** Pursh. Stems slender, erect or decumbent; herbage soft-pubescent; leaflets obovate, serrulate, notched at apex; heads 6 mm. broad; involucre about 9-lobed, the lobes erect, acuminate, cuspidate, entire; corolla white or rose-color.—Hillsides and valleys.

11. ***T. tridentatum*** Lindl. Stems mostly erect, 2 to 5 dm. high; leaflets

linear or lanceolate, sharply serrate; heads 2.4 cm. broad or more; involucre laciniate, much shorter than the flowers; calyx-tube strongly 10-nerved, the lobes usually 3-toothed; corolla bright purple, often tipped with white.—Hills and valley plains.

11. **T. variegatum** Nutt. WHITE-TIP CLOVER. Stems decumbent or ascending; leaflets obovate to oblong-oblanceolate, spinulose-serrulate; involucre laciniate, shorter than the heads; heads 3 to 15-flowered, 1.2 cm. broad or less; calyx-tube 15-nerved, its teeth entire; corolla deep purple or whitish; pod 2-seeded.—Low moist ground. Var. **MELANANTHUM** Greene. Heads 2.4 broad.—Low wet ground.

13. **T. involucreatum** Ortega. COW CLOVER. Stems decumbent, stout or even fistulous; leaflets obovate-oblong, denticulate; heads hemispherical, 2.4 cm. broad; involucre laciniately cleft, the tooth-like segments awned; calyx-tube scarious, 10-nerved, the alternate nerves less prominent, the lobes entire or some toothed; corolla rose-red; banner elliptical, deeply notched.—Springy places and along streams.

14. **T. fucatum** Lindl. SOUR CLOVER. Stems stout and succulent, much branched, diffuse or decumbent; herbage glabrous; leaflets obovate to inversely deltoid, spinulose-serrate or nearly entire; heads 2.4 to 4.2 cm. broad; corolla cream-color, fading pinkish, 1.4 to 2 cm. long; keel-petals frequently with a dark-purple spot; pod with a rather long stipe.—Valley levels, especially in alkaline places.

15. **T. amplexans** T. & G. Branches several from the base, decumbent or ascending, 7.2 to 36 cm. long; leaflets oblong-obovate, serrulate mostly toward the apex; heads 6 to 12 mm. broad; bracts of the involucre 5 to 7, ovate or oblong, 1.2 to 3.6 cm. long, commonly entire; corolla red-purple or whitish.—Valleys, alkaline plains or low hills.

16. **T. depauperatum** Desv. Similar to no. 15 but smaller and involucre reduced to small truncate lobes or a minute ring; corolla white or purple.—Hill country.

8. LOTUS L.

Herbs or some woody at base. Leaves pinnate, of 1 to many leaflets. Flowers in umbels or solitary. Stamens in 2 sets (9 and 1). Pods flattened or terete, 2 to several-seeded. (A Greek name.)

Flowers and pods erect or at least not reflexed; pods dehiscent.

Stipules large; leaflets mostly equally distributed on the opposite sides of the rachis; flowers in umbels; banner yellow; wings pink; perennials.....
1. *L. formosissimus*.

Stipules gland-like; leaflets commonly unequally distributed on the opposite sides of the rachis; flowers solitary; annuals.

Flowers in an elongated bracted peduncle.

Corolla twice as long as the calyx; pods constricted between the seeds; herbage glabrous.....2. *L. micranthus*.

Corolla scarcely exceeding the calyx; pods not constricted; herbage villous-pubescent3. *L. americanus*.

Flowers short-pedicel, not bracted; corolla much exceeding the calyx.

Calyx-teeth linear, much longer than the tube; pods oblong, 2 or 3-seeded4. *L. humistratus*.

Calyx-teeth equalling the tube; pods linear, 5 to 7-seeded.....
5. *L. subpinnatus*.

Flowers and pods reflexed; umbels sessile; stipules gland-like; pods with long and often curved points, 1 to 2-seeded, indehiscent.....6. *L. glaber*.

1. **L. formosissimus** Greene. Stems several from a thick and rather soft root, decumbent; herbage green and glabrous; leaflets 5 to 7, obovate or some deltoid, 6 to 16 mm. long; umbels 4 to 6-flowered, 3-foliate-bracted, on peduncles 2.4 to 4.8 cm. long; flowers exceeding 1.2 cm.; banner and keel yellow; wings purplish or white; pod straight, 3 cm. long, about 2 mm. broad.—Seaboard species, in wet grounds.

2. **L. micranthus** Benth. Simple or diffuse, 7.2 to 14.4 cm. high; leaflets 3 to 5, mostly 4, with one leaflet terminal and two on one side of the rachis and one on the other obovate to oblong, 4 to 10 mm. long; corolla minute, pale salmon color, turning red; pod linear, 14 to 20 mm. long.—Grassy hills, Coast Ranges.

3. **L. americanus** (Nutt.) Bisch. SPANISH CLOVER. Stems more or less branching, erect or diffuse, 2 to 4 dm. high; leaflets 1 to mostly 3, ovate to oblong, 6 to 24 mm. long or more; corolla whitish or pinkish, 4 to 6 mm. long; pod narrowly linear about 2.4 cm. long.—Dry hills and plains.

4. **L. humistratus** Greene. HILL LOTUS. Plants commonly forming mats 1.2 to 2 dm. broad; herbage soft-hairy; leaflets 4, narrowly oblong or cuneate-obovate, 6 to 10 mm. long, the rachis very broad; flowers sessile or nearly so; calyx-teeth much longer than the tube; corolla yellow, 6 to 8 mm. long; pod oblong, hairy, 2 or 3-seeded.—Sunny clay hillsides.

5. **L. subpinnatus** Lag. var. **wrangelianus** Jepson. Diffusely branched, 9.6 to 16.8 high; herbage short-pubescent or nearly glabrous; leaves as in preceding; flowers distinctly pediceled; corolla bright yellow, 8 to 9 mm. long; calyx-teeth as long as tube; pod linear, pubescent, 5 to 7-seeded.—Hill country.

6. **L. glaber** (Vogel) Greene. DEER-WEED. Stems tufted and reed-like, woody at base, the foliage often sparse; leaflets 4 to 6, mostly 3, oblong to linear-oblong, 6 to 12 mm. long; calyx-teeth subulate, $\frac{1}{3}$ as long as tube; corolla yellow, turning red, 6 to 8 mm. long.—Dry hills.

9. PSORALEA L.

Perennial herbs with heavy-scented dark-dotted herbage. Leaves with 3 leaflets. Flowers purple or whitish, in spikes or racemes. Pod seldom exceeding the calyx, 1-seeded, not splitting open. (Greek psoraleos, scurfy or rough, the glands wart-like in some species.)

Stems prostrate; leaves and peduncles erect; flowers racemose; stamens diadelphous.....1. *P. orbicularis*.

Stems erect.

Flowers in spikes, purple; tenth stamen nearly free.....2. *P. macrostachya*.

Flowers in racemes, greenish-white; stamens monadelphous....3. *P. physodes*.

1. **P. orbicularis** Lindl. Stems prostrate, creeping and rooting, the long-petioled leaves and peduncles erect; leaflets roundish or obovate, 6 to 7.2 cm. long; flowers purplish, in racemes; stamens diadelphous.—Grassy vales or meadows.

2. **P. macrostachya** DC. LEATHER ROOT. Plants 1 to 3 m. high, branching; leaflets ovate-lanceolate, 3.6 to 7.2 cm. long; peduncles much exceeding the leaves; calyx-teeth exceeding the petals; tenth stamen nearly free.—Rivers, cañon streams and marshes.

3. **P. physodes** Dougl. About 2 dm. high; leaflets ovate and acute,

or roundish, 2.4 to 4.8 cm. long; racemes short, dense; calyx-teeth rather more than $\frac{1}{2}$ as long as the corolla; corolla 10 to 12 mm. long; stamens monadelphous.—Bushy or wooded hills.

10. **ROBINIA** L. LOCUST

Trees or shrubs. Leaves pinnate, often with spines or prickles for stipules. Flowers showy, in axillary racemes. Calyx 5-toothed, the two upper teeth partly united. Standard large, turned back; keel incurved, blunt. Pod broadly linear, flat, several-seeded. (Jean Robin, father, and Vespasien Robin, son, herbalists to Henry IV of France.)

1. **R. pseudacacia** L. COMMON LOCUST. Tree; branchlets naked; racemes slender and loose-hanging; flowers fragrant, white; pods smooth.—Cult. from the e. U. S. It was used as a shade tree by the American settlers in California from the earliest days.

11. **ASTRAGALUS** L. RATTLE-WEED. LOCO-WEED

Herbs with pinnate leaves. Flowers in spikes, racemes or heads. Corolla usually long and narrow. Stamens diadelphous. Pod 2 to many-seeded, usually turgid or inflated and bladder-like. (Ancient Greek name for some leguminous plant.)

Pods strongly inflated; perennials.

Pods stipitate.

Stipe not more than twice as long as calyx.....1. *A. oxyphysus*.

Stipe more than twice as long as calyx.....2. *A. leucophyllus*.

Pods not stipitate.

Pods glabrous or sparsely pubescent.

Seed-bearing suture somewhat intruded; stipules distinct.....

3. *A. douglasii*.

Seed-bearing suture not intruded: stipules meeting or united on opposite side of stem from leaf.....4. *A. menziesii*.

Pods rather densely pubescent.....5. *A. hornii*.

Pods not strongly inflated.

Perennials.

Pods stipitate6. *A. trichopodus*.

Pods not stipitate.....7. *A. pycnostachyus*.

Annuals; pods not stipitate.

Pods elliptic-ovate, 2-seeded, wrinkled transversely.

Pods erect, little exerted from the calyx.....8. *A. didymocarpus*.

Pods deflexed, well exerted from the calyx.....9. *A. nigrescens*.

Pods linear or nearly so, several to many-seeded, not wrinkled transversely10. *A. tener*.

1. **A. oxyphysus** Gray. Stems rigid, erect, 5 to 8 dm. high; leaflets 15 to 23, oblong to linear-oblong; racemes elongated; flowers white or greenish-white, 14 to 16 mm. long; pods semiobovate, 3.6 to 4.8 cm. long; seeds numerous.—Inner South Coast Ranges.

2. **A. leucophyllus** T. & G. Stems erect, stoutish, 5.7 to 8.6 dm. high; leaflets 21 to 31, narrowly oblong or linear, 12 to 20 mm. long; raceme densely flowered and long-peduncled; flowers yellowish white; pods on a long thread-like stipe, 3 to 3.6 cm. long.—Low dry hills, inner ranges, cent. Cal. Said to be poisonous to horses and sheep.

3. **A. douglasii** (T. & G.) Gray. Stems ascending, 3 to 8 dm. high; leaflets 15 to 25, linear to oblong-linear; racemes many-flowered; flowers whitish or yellow, spreading; pods remarkably inflated, oblong to ovate.—South Coast Ranges to the mts. of S. Cal.

4. **A. menziesii** Gray. Stems erect or decumbent, 2.8 to 11.5 dm. high;

leaflets usually many, oblong or oblong-ovate; racemes dense; flowers whitish; pods early reflexed, ovoid.—Sandy slopes near the coast.

5. *A. hornii* Gray. SHEEP LOCO. Stems slender, widely spreading, 8.6 to 11.5 dm. long; leaflets about 21, narrowly oblong; flowers in dense capitate spikes, yellowish-white; pods broadly ovate, acuminate, straight, pilose, 6 to 15-seeded.—Upper San Joaquin Valley to the San Bernardino Valley.

6. *A. trichopodus* Gray. Stout, erect, 3 to 8 dm. high; leaflets numerous, narrowly oblong or cuneate-oblong; racemes short, dense; flowers yellowish-white; pods narrowly elliptic.—Santa Barbara Co. to Los Angeles Co.

7. *A. pycnostachyus* Gray. Stem rather stout, 3 to 8 dm. high; leaflets 23 to 31, narrowly oblong, crowded; flowers whitish or yellowish, in dense spikes; pods ovate, veined, retrorsely imbricated.—Along the coast.

8. *A. didymocarpus* H. & A. Slender pubescent plants 7.2 to 24 cm. high; leaflets oblong to linear and more or less cuneate, notched at apex, 6 to 10 mm. long; spikes capitate or oblong; flowers 3 to 5 mm. long, dull purplish; calyx black-hairy; pods erect, little exerted from the calyx.—Low hills.

9. *A. nigrescens* Nutt. Similar to no. 8; spikes cylindrical; pods deflexed, well exerted from the calyx.—Hill country.

10. *A. tener* Gray. Slender plants 9.6 to 21 cm. high; leaflets 9 to 15, linear or cuneate; flowers purple and white, 10 mm. long, in a capitate inflorescence; pod silvery when young, glabrous when mature, 1.6 cm. long, 5 to 10-seeded.—Alkaline fields.

12. ARACHIS L.

Annual herbs with pinnate leaves. Leaflets 4. Flowers in a dense axillary sessile spike. Ovary stipitate. Stipe elongating and carrying the immature fruit beneath the ground where it ripens. Pod indehiscent, 1 to 3-seeded. (Greek, *a*, without, and *rachis*, rachis.)

1. *A. hypogaea* L. PEANUT. GOOBER. Stems procumbent; leaves abruptly pinnate; leaflets 2 pairs.—Cult. from S. Am.

13. VICIA L. VETCH. TARE

Herbs with weak angular stems, often slightly climbing. Leaves pinnate, with semi-sagittate stipules, the rachis ending in a simple or branched tendril. Flowers solitary or racemose on axillary peduncles. Calyx 5-toothed, the 3 lower teeth often longer. Stamens more or less in 2 sets. Style with a tuft of hairs below the stigma. Pod flat, 2 to several-seeded. (Classical Latin name.)

Annuals; flowers 1 or 2 in a cluster.

Flowers subsessile in the axils.....1. *V. sativa*.

Flowers on a peduncle.....2. *V. exiguua*.

Perennials; flowers many or several in a cluster.

Leaflets 8 to 14, broadly oblong.....3. *V. americana*.

Leaflets 20 to 30, narrowly oblong.....4. *V. gigantea*.

1. *V. sativa* L. COMMON VETCH. Stem slender, 3 to 5 dm. high; leaflets 6 to 12, oblong or linear, truncate or retuse, mucronate; flowers sub-sessile in the axils.—Nat. from Eur.

2. *V. exigua* Nutt. CALIFORNIA VETCH. Leaflets 4 to 12; flowers on a peduncle 1.2 to 3.6 cm. long.—Cent. to S. Cal.

3. *V. americana* Muhl. Stems 5 to 8 dm. long, trailing or climbing, sharply 4-sided or 4-winged; leaflets broadly oblong, 1.2 to 2.4 cm. long; peduncles 4 to 8-flowered; flowers purplish, changing to bluish, 1.8 cm. long.—Hill country. Var. *LINEARIS* Wats. Leaflets very narrow, 3 mm. wide or less. Var. *TRUNCATA* Brewer. Leaflets broad, truncate at apex and 3-denticulate.

4. *V. gigantea* Hook. GIANT VETCH. Stout, climbing 8 to 17 dm. high and often forming extensive tangles over shrubs; leaflets 20 to 30, narrowly oblong; peduncles 7 to 18-flowered; flowers pale purple.—Along streams.

14. LATHYRUS L. PEA

Perennial herbs, very like *Vicia*, but leaflets usually larger (in 3 to 5 pairs) and style flattish and hairy along the upper side only. (Old Greek name of the pea.)

1. *L. vestitus* Nutt. Stems angled, often 5 to 11 dm. high; leaflets about 2.4 cm. long, 4 to 8 mm. wide; stipules narrowly semi-sagittate; raceme many-flowered; corolla purplish.—Hill country.

15. PISUM L. PEA

Climbing herbs with pinnate leaves, the common petiole terminated by a tendril. Leaflets 1 to 3 pairs. Calyx-lobes leafy. Style rigid, widened above, bearded down the inner edge. Pods several-seeded. Seeds globose. (Latin name of the pea.)

1. *P. sativum* L. GARDEN PEA. Tendril-climbing; glabrous and glaucous; leaflets oval or ovate, 2 or 3 pairs; stipules large, leafy; flowers few on axillary peduncles, white; pods rather fleshy.—Cult. from Eur.

16. PHASEOLUS L. BEAN

Annual or perennial mostly twining herbs. Leaves pinnately 3-foliate. Flowers clustered on axillary peduncles. Keel of corolla coiled into a spiral. Pod scimitar-shaped. (Ancient Latin name, somewhat altered, of a bean.)

1. *P. vulgaris* L. STRING BEAN. POLE BEAN. Twining racemes of white, purplish or variegated flowers shorter than the leaves; pods linear, straight; seeds tumid.—Cult. from trop. Am.

2. *P. lunatus* L. LIMA BEAN. Twining; racemes of small greenish-white flower shorter than the leaves; pods broad, curved; seeds flat.—Cult. from S. Am.

PUNICACEAE. POMEGRANATE FAMILY

Shrubs or trees. Leaves opposite or nearly so, persistent, entire. Flowers perfect, red. Calyx and corolla 6 (or 5 to 8)-merous. Ovary inferior, with the carpels in two superimposed series of 3 and 5.—Species 2, Asia.

1. PUNICA L.

Small tree. Flowers in simple axillary racemes. Calyx persistent. Fruit a spherical thick-skinned many-celled berry. (*Punicus*, Carthagi-

nian, hence *Malum punicum*, apple of Carthage, an early name of the Romans for the pomegranate.)

1. ***P. granatum*** L. POMEGRANATE. Leaves oblong or obovate, shining; flowers orange-red, showy; ovary with two series of cells ripening into a large juicy and many-seeded pome-like berry.—Cult. from Persia.

MYRTACEAE. MYRTLE FAMILY

Shrubs or trees. Leaves opposite or alternate, simple, undivided and mostly entire, glandular-dotted and aromatic. Flowers perfect, regular, calyx and corolla 4 or 5-merous. Stamens many. Ovary inferior, 2 to 4-celled; style 1.—A large family of about 2100 species, confined almost entirely to the tropics. *Bertholletia excelsa* H. & B. produces the Brazil Nuts of our markets; *Eugenia caryophyllata* Thunb., of the tropics, furnishes cloves; while *Myrtus communis* L., of the Mediterranean region, is the Myrtle Tree of our gardens.

1. **EUCALYPTUS** L'Herit. GUM-TREE

Mostly large trees with simple rigid entire leaves. Flowers usually in umbels. Calyx-tube adnate to the ovary at the base; flower apparently apetalous, distinct petals none, the petals and calyx-lobes forming a cap which is circumscissile. Stamens numerous. Fruit a capsule.—Species about 300, Australia and the adjacent islands. About 50 species are cult. in Cal.

Flowers solitary or 2 or 3 together, sessile or nearly so; breadth of fruit over 1.2 cm.1. *E. globulus*.
Flowers in stalked umbels; breadth of fruit 4 to 6 mm.....2..... *E. rostrata*.

1. ***E. globulus*** Labill. BLUE-GUM. Tree 15 to 29 m. high; bark deciduous in thin strips; adult leaves thick, 1.4 to 2.8 dm. long; calyx-tube and lid warty.—Cult. from Austr. It is extensively planted in Cal., the wood used for interior finish, fuel, agricultural implements and small articles, such as collection boxes.

2. ***E. rostrata*** Schlecht. RED-GUM. Tree 20 to 35 m. high; bark dark grey, deciduous or not; leaves 9.6 to 14.4 cm. or more long.—Cult. from Austr. The tree is esteemed because it withstands drought and endures heat. The wood is used for railroad ties, piles, and fence-posts.

ONAGRACEAE. EVENING PRIMROSE FAMILY

Herbs with simple leaves. Flowers symmetrical. Calyx-lobes 4. Petals 4. Stamens 8, rarely 4. Pollen commonly cobwebby. Ovary inferior, 4-celled. Style 1, the stigma 4-lobed or capitate. Fruit a capsule.—About 470 species, chiefly in temperate regions of northern hemisphere.

Seeds with a tuft of hairs at one end.

Corolla and calyx scarlet.....1. **ZAUSCHNERIA**.

Corolla white or purplish.....2. **EPILOBIUM**.

Seeds naked.

Flowers purple, rose-color or white, never yellow.

Petals distinctly clawed, entire or lobed.....3. **CLARKIA**.

Petals not clawed, not lobed in ours.....4. **GODETIA**.

Flowers yellow or sometimes white.....5. **OENOTHERA**.

1. **ZAUSCHNERIA** Presl

Low perennials, the stems woody at base. Leaves mostly alternate.

Flowers large, scarlet, Fuchsia-like. Calyx above the ovary colored like the corolla, the tube appendaged within with scales. Petals inserted on throat of the calyx. Stamens exserted, colored like the corolla. Style long-exserted. (M. Zauschner, a Bohemian botanist, one time Professor of Natural History in the University of Prag.)

1. **Z. californica** Presl. BALSAMEA. Leaves oblong to lanceolate or narrowly linear; flowers 3.6 to 4.8 cm. long.—Dry stream beds and rocky mountain sides. A decoction of the foliage and also the powdered leaves are used for cuts and bruises in horses.

2. **EPILOBIUM** L. WILLOW HERB

Annual or perennial by creeping rootstocks, or by offsets. Leaves usually opposite. Flowers purple, rose-color or white in racemes. Stamens 8, the 4 alternate shorter. Ovary long and narrow. (Greek *epi*, upon, *lobus*, a pod, and *ion*, a violet.)

Petals 10 to 14 mm. long, entire; capsule 5.1 to 7.6 cm. long.....1. *E. angustifolium*.
Petals 6 to 8 mm. long, emarginate; capsule 2.5 cm. long.....2. *E. paniculatum*.

1. **E. angustifolium** L. FIRE-WEED. Stems simple, erect from a stout root, 8 to 23 dm. high, canescent above; leaves glabrous, pale below, lance-linear to lanceolate; inflorescence many-flowered, with bracts; petals spreading, purple.—In moist or boggy ground especially in fire-swept areas.

2. **E. paniculatum** Nutt. Stem simple below, paniculately branched above, 4 to 14 dm. high; bark exfoliating; herbage glabrous with inflorescence more or less glandular; leaves lanceolate to linear; racemes few-flowered; petals ascending, purplish.—Dry ground.

3. **CLARKIA** Pursh

Annuals with brittle stems and alternate leaves. Flowers showy, in a terminal raceme, nodding in the bud. Petals purple or rose-color, clawed. Stamens 8, or 4 rudimentary or wanting. Capsule straight or somewhat curved, coriaceous, somewhat 4-angled. (Captain Clarke of the Lewis & Clarke party, first expedition across the Rocky Mts. to the Pacific, 1806.)

Petals entire; calyx-tube above the ovary obconical, 2 to 4 mm. long; stamens 8.

Claw much shorter than limb of petal, often toothed.....1. *C. rhomboidea*.

Claw about as long as limb of petal, not toothed.....2. *C. elegans*.

Petals lobed; calyx-tube above the ovary almost filiform, 1.9 to 3.2 cm. long; stamens 43. *C. concinna*.

1. **C. rhomboidea** Dougl. Erect, 2.8 to 8.6 dm. high; petals rose-purple, often purple-dotted toward the base, rhomboidal, 6 to 18 mm. long, the claw short and broad; filaments with whitish hairy scales at base.—Foothills and mountains.

2. **C. elegans** Dougl. Similar to no. 1; claw of petals about as long as limb, not toothed.—Foothills and mountains.

3. **C. concinna** (F. & M.) Greene. RED RIBBONS. Simple or diffusely branched, 1.5 to 4 dm. high; petals cuneate-obovate, 3-lobed, 1.2 to 2.4 cm. long.—Mountain ranges at middle altitudes.

4. **GODETIA** Spach

Erect annuals. Flowers in leafy racemes or spikes. Calyx-tube above the ovary obconic or short-funneliform. Petals rose-color or lilac-purple

to nearly white, often marked with spots of deeper color. (C. H. Godet. 1797-1879, author of "Flora de Jura.")

Capsule not ribbed or indistinctly so, terete or teretish.

Flowers loosely spicate-paniculate.....1. *G. amoena*.

Flowers spicately scattered.

Buds nodding2. *G. bottae*.

Buds erect.

Calyx-lobes commonly distinct and closely reflexed.....

3. *G. quadrivulnera*.

Calyx-lobes united and turned to one side under the open flower.....

4. *G. epilobioides*.

Capsule 8-ribbed, more or less 4-sided.....5. *G. purpurea*.

1. *G. amoena* (Lehm.) Lilja. SUMMER'S DARLING. Loosely branching. 4 to 7 dm. high; petals cuneate-obovate, truncate or obtuse at apex, abruptly short-clawed, 1.8 to 2.4 cm. long; capsules 2.4 to 3.6 cm. long, narrowed at both ends.—Santa Cruz and n.

2. *G. bottae* Spach. Erect, simple or branching from the base, 3 to 7 dm. high; leaves linear to lanceolate; petals pink or light crimson, 1.2 to 2.5 cm. long; capsules scattered.—S. Cal. and South Coast Ranges.

3. *G. quadrivulnera* (Dougl.) Spach. Simple or with erect branches from the base, finely pubescent; leaves linear or narrowly oblong; petals purplish, often with a crimson spot, 1.2 cm. long; capsules 4-sided, 2 ribs on each side.—Hill country.

4. *G. epilobioides* Wats. Plants 1.5 to 7.6 dm. high, with slender, mostly simple stems; calyx red; petals light purple or white, 6 to 12 mm. long; capsules shortly pediceled.—S. Cal.

5. *G. purpurea* (Curtis) Don. Stem simple and stout, 1.5 to 6 dm. high; leaves ovate-oblong or oblong, the upper oblong-lanceolate or lanceolate; petals broad wedge-shape, light crimson with a darker spot in middle at apex.—Open valleys.

5. OENOTHERA L.

Flowers yellow or white, often turning reddish or greenish. Calyx-tube prolonged beyond the ovary, its lobes reflexed. Capsule chartaceous to woody, often contorted or spirally coiled, sessile. (Greek oinos, wine, and therea, pursuit, name given by Dioscorides to some now unknown plant, the roots of which were eaten to incite desire for wine.)

Calyx-tube much prolonged beyond the ovary.

Calyx-tube linear; stem leafy.

Tall plants; flowers yellow.....1. *O. biennis*.

Low plants; flowers white.....2. *O. californica*.

Calyx-tube filiform; stem subterranean; leaves in rosettes on the ground.

Perennial; leaves ovate or oblong.....3. *O. ovata*.

Annual; leaves linear.....4. *O. graciliflora*.

Calyx-tube obconic, little prolonged beyond ovary; stems leafy.

Capsule sharply quadrangular, contorted or coiled.

Herbage canescently pubescent; leaves thick, mostly entire.....

5. *O. cheiranthifolia*.

Herbage more less hirsute; leaves thinner, denticulate.

Petals 2 to 4 mm. long, not spotted.....6. *O. micrantha*.

Petals 8 to 14 mm. long, spotted at base.....7. *O. bistorta*.

Capsule narrowly linear, obtusely angled.

Flowers axillary, yellow.....8. *O. strigulosa*.

Flowers in a nodding spike, white or rose-color; capsule contorted.....

9. *O. gauraeiflora*.

1. *O. biennis* L. Biennial, stout, usually simple, 3 to 15 dm. high, more or less hirsute; leaves lanceolate to oblong, mostly sessile; flowers opening at night.—Throughout U. S.

2. *O. californica* Wats. Stems several from a perennial rootstock, ascending; calyx-tips free in the bud; petals white, fading purplish; flowers opening at night and remaining open two or three hours in the morning.—Sacramento Valley to S. Cal.

3. *O. ovata* Nutt. GOLDEN EGGS. Root fleshy; leaves 7.2 to 14.4 cm. long; calyx-tube 7.2 cm. long; petals yellow, orbicular 1.2 cm. long; ovary and capsules more or less below the surface of the ground, the latter 2.4 cm. long.—Coast Range valleys.

4. *O. graciliflora* H. & A. Annual; leaves erect or ascending 8.9 cm. long or less; petals yellow, broadly obovate, with a shallow notch at apex, 6 to 8 mm. long.—Hillsides.

5. *O. cheiranthifolia* Hornem. Stems prostrate or decumbent, rigid and tough, radiating from a central rosette crowning the perennial root; young herbage white-pubescent; leaves obovate to oblanceolate, the upper sessile; petals yellow, aging red or green as in the next, broader than long, 6 to 10 mm. long; capsules sharply 4-angled, becoming contorted.—Sand dunes along the coast.

6. *O. micrantha* Hornem. Habit of no. 5 but branches not tough; pubescence hirsutulous; leaves oblong, lanceolate or oblanceolate, often undulate, denticulate; petals entire or notched, 2 to 4 mm. long; capsules sharply 4-angled, becoming contorted, 2.4 long.—Maritime.

7. *O. bistorta* Nutt. Annual; stem at first a very short primary axis bearing a basal tuft of leaves and flowers, later producing erect or decumbent leafy flowering branches 1.4 to 4 dm. long; leaves linear or lanceolate (or the basal ones oblong-obovate); petals yellow, often with a small brown spot at base, broadly obovate, 8 to 14 mm. long; capsules 1.8 to 2.7 cm. long, 2 mm. wide, narrowed upward, more or less curved or flexuous.—S. Cal., sandy soils.

8. *O. strigulosa* T. & G. Slender erect or at length diffusely branched annuals 1.4 to 2.4 dm. high; leaves linear, mostly 1.2 cm. long; petals 2 to 4 mm. long, aging to bright red.—Sandy lands.

9. *O. gauraeflora* T. & G. Annual; often stout, erect, 1.5 to 6 dm. high; bark loose, white, shining; leaves lanceolate to narrowly oblanceolate; spike often many-flowered; capsules attenuate from the base to a narrow beak.—S. Cal. and n.

CORNACEAE. DOGWOOD FAMILY

Shrubs or low plants with opposite simple leaves, 4 petals, 4 stamens, a single style, and an inferior 2-celled ovary becoming a 1 or 2-seeded fleshy stone fruit. Calyx-tube coherent with the ovary, its limb represented by 4 small teeth at the summit or none.—Species about 120, north temperate regions.

1. CORNUS L. CORNEL. DOGWOOD

Leaves entire. Flowers small in open clusters or close heads. (Latin cornu, a horn, on account of the hardness of the wood.)

Flowers in a flat-topped cluster, not involucre.

Leaves lighter colored beneath; drupe white.....1. *C. californica*.

Leaves all green; drupe bluish or pale.....2. *C. glabrata*.

Flowers in a close head, surrounded by an involucre of 4 to 6 large white bracts;
drupe scarlet3. *C. nuttallii*.

1. ***C. californica*** C. A. Mey. CREEK DOGWOOD. Shrub 1.5 to 4 m. high with smooth purplish branches; leaves ovate to elliptical, acute, 4.8 to 9.6 cm. long; petals 4 mm. long.—Common on cañon stream banks.

2. ***C. glabrata*** Benth. Shrub 1.5 to 5 m. high, with nearly or quite glabrous twigs; leaves ovate or oblong, usually acute at each end, 3 to 4.8 cm. long; petals 3 to 4 mm. long.—Common along the bases of low hills, often forming thickets; also in stream beds or borders of swamps.

3. ***C. nuttallii*** Aud. MOUNTAIN DOGWOOD. Small tree 8 to 12 m. high; leaves 7.2 to 14.4 cm. long; involucre bracts 3.6 to 7.2 cm. long; flower heads 1.2 to 2.4 cm. broad, borne on peduncles 2.4 to 3 cm. long.—Mountain woods. The inflorescence is remarkably beautiful.

GARRYACEAE. SILK TASSEL FAMILY

Shrubs or small trees. Leaves simple, opposite. Flowers dioecious, apetalous, borne along a pendulous catkin-like axis in the axils of the decussately opposite connate bracts. Staminate flowers 3 in each axil; calyx 4-parted; stamens 4. Pistillate flower 1 in each axil; calyx limb reduced; ovary inferior, 1-celled; ovules 2; styles 2. Fruit a berry, the epicarp dry and brittle, sometimes dehiscent irregularly.—Species 4 or 5, western North America.

1. GARRYA Dougl.

The only genus. (Nicholas Gary, Hudson Bay Co., friend of David Douglas, botanical explorer.)

1. ***G. elliptica*** Dougl. SILK TASSEL BUSH. Shrub or small tree 1.5 to 4 m. high; leaves elliptical, undulate-margined, glabrous above, tomentose beneath.—Seaward ranges, Monterey Co. n.

2. ***G. fremontii*** Torr. BEAR BRUSH. Shrub 1.6 to 3 m. high; leaves plane, oblong, varying to elliptic, glabrous and shining above, puberulent or tomentose, in age often glabrous, often yellow in age.—Chaparral slopes, inner ranges.

ARALIACEAE. GINSENG FAMILY

Very like Umbelliferae, but the stems solid, the styles usually more than 2 and fruit berry-like.—Species 400, tropical and temperate regions.

Erect plants; leaves compound.....1. ARALIA.
Stems climbing by adventitious rootlets; leaves simple.....2. HEDERA.

1. ARALIA L. SPIKENARD

Leaves compound. Flowers in simple or paniced umbels, white or greenish. Styles 5, united to the middle. Fruit black. (Derivation uncertain.)

1. ***A. californica*** Wats. ELK-CLOVER. Herbs 1 to 2 m. high, the stems from a stout rootstock with milky juice; leaves ternate, each division pinnately 3 to 5-foliolate; leaflets ovate, varying to elliptic, 1.4 to 2.8 dm.

long; flowers 50 to 60 in a single umbel; calyx a mere rim; berry black.—Wooded cañons.

2. HEDERA L. Ivy

Woody evergreen plants climbing by adventitious rootlets, with simple palmately 3 to 5-lobed or angled leaves or those of the upper flowering branches ovate. Flowers greenish, in paniced or clustered umbels. Ovary 5 or 10-celled, the 5 styles united into a conical column. Berry black. (Ancient Latin name of the ivy.)

1. *H. helix* L. ENGLISH IVY. Climbing on shady walls; leaves roundish cordate, glossy.—Cult. from Eur.

UMBELLIFERAE. PARSLEY FAMILY

Herbs with commonly hollow stems. Leaves compound or often simple. Flowers small, in simple or compound umbels, or the umbel reduced to a head. Calyx-tube adherent to the ovary, with 5 minute or obsolete teeth. Petals 5. Stamens 5. Styles 2. Ovary 2-celled, splitting when ripe into 2 seed-like fruits, each half often with 5 longitudinal ribs on the back and with longitudinal oil-tubes in the tissue of the pericarp.—The 5 ribs of the fruit are sometimes conspicuous, with one down the back (the dorsal), one on each side (the lateral) and two between (the intermediate).—This important family, containing about 1300 species, is found in all continents but is most abundant in the northern hemisphere. It is remarkable for containing a large number of poisonous, edible and aromatic plants. The foliage of Poison Hemlock (*Conium maculatum* L.) and Fool's Parsley (*Aethusa cynapium* L.) are deadly poisons, as are the roots of Water Hemlock (*Cicuta*), while the roots and leaves of many other species described below are edible. The fruits or "seeds" are wholesome, in all probability, in all species.

A. *Fruit bearing prickles, bristles, scales or tubercles.*

Ribs and oil-tubes none.

Fruit covered with scales; flowers greenish-white or blue.....1. ERYNGIUM.

Fruit covered with hooked prickles; flowers yellow or purple....2. SANICULA.

Ribs present; flowers white.

Oil-tubes none or obscure.

Fruit conspicuously long-beaked; annuals.....3. SCANDIX.

Fruit not beaked or short-beaked; perennials.....4. OSMORRHIZA.

Oil-tubes present, usually conspicuous.

Ribs armed with bristles.....5. DAUCUS.

Ribs not armed, inconspicuous; fruit tuberculate-roughened.....

6. APIASTRUM.

B. *Fruit not prickly or tuberculate nor scaly.*

Leaves simple; umbels simple.....7. BOWLESIA.

Leaves compound; umbels compound.

Ribs of the fruit not winged.

Flowers white, rarely pinkish.

Oil-tubes none; fruit ovate; stems purple-dotted.....8. CONIUM.

Oil-tubes present.

Petals conspicuously unequal.....9. CORIANDRUM.

Petals equal or essentially so.

Umbels subsessile in the forks and terminal on the branches.

10. APIUM.

- Umbels terminal on the branches.
- Leaflets entire.....11. CARUM.
- Leaflets serrate12. CICUTA.
- Flowers yellow.
- Stems of medium height; leaves mostly basal.....13. VELAEA.
- Stems very tall, leafy, with finely dissected leaves..14. FOENICULUM.
- Some or all ribs of the fruit winged.
- Lateral ribs winged, dorsal and intermediate ribs filiform.
- Oil-tubes half way to the base of fruit; corollas unlike.....
15. HERACLEUM.
- Oil-tubes as long as fruit; corollas all alike.
- Stems none or very short.....16. LOMATIUM.
- Stems tall, leafy.
- Leaves pinnate17. PASTINACA.
- Leaves ternately compound.....18. ANETHUM.
- Lateral, dorsal and intermediate ribs winged or very prominent.....
19. ANGELICA.

1. ERYNGIUM L. BUTTON SNAKEROOT

Perennials with clustered coarse fibrous roots, prickly involucre and often prickly leaves. Flowers greenish-white or blue, in heads which are terminal on the branches or short-peduncled in the forks. Bracts and bractlets spinose, conspicuous. (Greek name used by Dioscorides.)

1. **E. vaseyi** C. & R. COYOTE-THISTLE. Plants growing in shallow pools; earliest leaves terete, pointed, in a basal tuft, disappearing early and succeeded by short erect leafy stems; leaves narrowly oblanceolate, 9.6 to 23 dm. long, the upper much shorter, incised or bearing small lanceolate lobes below; fruit with abruptly cuspidate calyx-lobes.—Low places in fields.

2. SANICULA L. SNAKEROOT

Glabrous perennial herbs, the stems naked or few-leaved. Leaves palmately lobed or pinnately divided. Flowers greenish-yellow or purple, borne in head-like clusters, which are disposed in few-rayed umbels. Fruit densely covered with hooked prickles. (Diminutive form derived from Latin sanere, to heal, certain species used in medicine.)

Mature fruit pediceled; leaves palmately lobed or divided.

Bractlets conspicuous; plants prostrate or decumbent.....1. *S. arctopoides*.

Bractlets inconspicuous; plants erect.

Leaf divisions broad, not toothed to the very base.....2. *S. menziesii*.

Leaf divisions narrow, decurrent below into a conspicuously toothed rachis3. *S. arguta*.

Mature fruit sessile.

Stems from the more or less thickened crown of a tap root.

Flowers purple; leaves bipinnatifid, the main divisions decurrent on the toothed rachis4. *S. bipinnatifida*.

Flowers yellow; leaves palmately cleft.....5. *S. laciniata*.

Stems from a tuberous root.

Leaves pinnate; tuber elongated.....6. *S. bipinnata*.

Leaves ternate; tuber globose7. *S. tuberosa*.

1. **S. arctopoides** H. & A. FOOTSTEPS-OF-SPRING. Stem short, bearing at base a tuft of leaves and above several divergent and decumbent scape-like branches, each terminating in an umbel of 1 to 3 rays; bracts foliaceous; bractlets entire, much exceeding the yellow flowers.—Open or brushy hills, vicinity of the ocean.

2. **S. menziesii** H. & A. GAMBLE WEED. Stems erect, sparingly branched, 2.8 to 14.4 dm. high; basal leaves roundish in outline, 4.8 to 12

cm. broad, palmately 3 to 5-cleft, the divisions again cleft and serrate; bracts toothed; bractlets entire, shorter than the yellow flowers.—Open woods of the hill country.

3. **S. arguta** Greene. Stems sparingly branched, 1.9 to 3.3 dm. high; leaves mainly basal, palmately 5 to 7-divided, all the divisions more or less pinnately parted and toothed and decurrent; bractlets membranous, oblong; flowers yellow.—Coastal S. Cal.

4. **S. bipinnatifida** Dougl. PURPLE SANICLE. Stems branching, leafy below, 2 to 5 dm. high; leaves pinnately 5 to 7-parted or -divided, the divisions laciniately lobed and toothed and decurrent on the toothed rachis; flowers purple, in dense heads borne in simple or partly compound umbels; bracts foliaceous; bractlets 13 or 14, lanceolate.—Grassy hills.

5. **S. laciniata** H. & A. COAST SANICLE. Stems from a medium tap root, few-branched, 1 to 3 dm. high; leaves mostly basal, roundish, palmately 3-cleft or parted; umbel with 2 to 5 unequal rays; bractlets oblong-ovate or lanceolate; flowers yellow.—Slopes of coast hills from Humboldt Co. to Monterey Co.

6. **S. bipinnata** H. & A. POISON SANICLE. Stems from an elongated tuber-like root, erect, 2 to 5 dm. high; herbage aromatic; leaves chiefly basal, twice or thrice pinnate; umbel with 3 or 4 rays and leaf-like bracts; flowers yellow; fruit tuberculate.—Shady woods in the low hills.

7. **S. tuberosa** Torr. TURKEY PEA. Stem from a globose tuber, simple or divided into peduncle-like branches; leaves ternately and several times dissected into subulate segments; bracts foliaceous; bractlets ovate or lanceolate; flowers yellow, in heads, the heads disposed in a more or less compound few-rayed umbel.—Gravelly hillsides.

3. SCANDIX L.

Annuals with dissected decompound leaves. Flowers polygamous, in compound umbels. Staminate flowers with a green disk. Pistillate flowers with a purple disk. Rays commonly 2. Fruit linear, flattened laterally, with prominent ribs, prolonged into a beak several times longer than the body. (The Greek name.)

1. **S. pecten-veneris** L. SHEPHERD'S NEEDLE. Erect, simple or branching, 12 to 38 cm. high, sometimes hispidulous; leaves 2 or 4 times pinnately dissected into linear segments; bractlets 2 or 3-toothed at apex or entire; rays 1.2 to 2.4 cm. long.—San Francisco Bay region.; nat. from Eur.

4. OSMORRHIZA Raf. SWEET CICELY

Perennials with thick aromatic roots. Leaves mostly basal, 2 to 3 times ternately compound. Flowers in compound umbels. Fruit linear or linear-oblong, smooth or bristly along the ribs. (Greek osme, odor, and rhiza, root.)

1. **O. nuda** Torr. Stems glabrous, 4 to 7 dm. high; leaves 1.2 to 2.6 dm. long, the cauline much reduced; rays 3 or 4 to 6; fruit attenuate into a slender base, at apex more or less beaked, the base and ribs bristly.—Shady woods.

5. DAUCUS L.

Bristly herbs with many times dissected leaves. Flowers white, in a

compound umbel which is surrounded by cleft leafy bracts and borne on long peduncles. Ribs of the fruit with barbed prickles or bristles. (Daukos, the Greek name.)

1. *D. pusillus* Michx. RATTLESNAKE WEED. Plants about 9.6 to 24 cm. high; stems and peduncles retrorsely hispid; bracts divided into short linear or lanceolate segments; rays 4 to 10 mm. long, rarely 2.4 to 3.6 cm. long.—Hill country. The herbage was used by the native tribes as an antidote for rattlesnake bite by direct application on the wound.

2. *D. carota* L. CARROT. Stems erect, branching 5 to 8 dm. high, commonly smooth; bracts divided into short linear or lanceolate segments; rays 2.4 to 6 cm. long; fruiting umbel resembling a bird's nest.—Cult. from Eur. for its edible root; also naturalized in valley lands.

6. *APIASTRUM* Nutt.

Small branching glabrous annuals with dissected leaves. Flowers in irregularly compound umbels. Rays and pedicels unequal. Fruit somewhat laterally compressed, elliptic-cordate. Oil-tubes solitary in the intervals. (Apium, celery, and aster, Latin suffix meaning wild.)

1. *A. angustifolium* Nutt. Erect, 1 to 2 (or 3.6 dm.) high; leaves twice or thrice ternately dissected into linear segments; umbels sessile in the forks or opposite the upper leaves, of 2 or 3 umbellets and 1 or 2 sessile flowers in the center; umbellets 3 or 4-flowered; fruit cordate.—Dry mountain slopes or sandy valleys.

7. *BOWLESIA* R. & P.

Small and delicate pubescent annual with opposite simple leaves and scarious stipules. Umbels simple, few-flowered, axillary. Flowers white, minute. Fruit ovate, somewhat flattened laterally, with no ribs or oil-tubes. (Wm. Bowles, 1705-1780, Irish naturalist and traveler.)

1. *B. lobata* R. & P. Stems mostly branching at the base, weak and trailing, 1.4 to 5.7 dm. long, flowering from the base; leaves thin, 5-lobed, broader than long; umbels 1 to 4-flowered.—Shaded places in the hills.

8. *CONIUM* L.

Tall branching biennial with dissected decomposed leaves. Bracts and bractlets small. Flowers white. Fruit broadly ovate, somewhat laterally flattened, with prominent ribs. (Greek name of the Hemlock.)

1. *C. maculatum* L. POISON HEMLOCK. Tall, the stem dotted with purple marks; herbage with a mouse-like odor; leaves 2.8 to 5.7 dm. long or more; rays 10 to 16.—Shady or moist ground; nat. from Eur. The herbage is poisonous.

9. *CORIANDRUM* L.

Slender glabrous strong-smelling annuals with leafy stems, the lower leaves pinnate or bipinnate, the upper finely dissected. Flowers white or rose-tinted, in compound umbels. Fruit subglobose, with filiform or acute ribs. (Ancient Latin name.)

1. *C. sativum* L. CORIANDER. Stems 3 to 7 dm. high; leaflets of lower leaves roundish or ovate; divisions of upper leaves linear.—European garden plant, cult. from the Orient, occasionally escaped. The seed-like fruits are aromatic and used as flavoring in cookery.

10. **APIUM** L.

Erect glabrous biennials with fibrous roots and pinnate leaves, the stems branching. Umbels compound, opposite the leaves. Flowers white. Fruit elliptic-ovate or broader than long, with prominent ribs. (Old Latin name of celery.)

1. **A. graveolens** L. COMMON CELERY. Stems 6 to 11.5 dm. high; lower leaves long-petioled; upper leaves short-petioled or sessile, the leaflets 3.—Garden plant from Eur.; also nat. in marshes and along streams. The blanched leaf-stalks are eaten raw and also cooked.

11. **CARUM** L.

Erect slender glabrous biennials or perennials. Leaves pinnate with few linear leaflets. Flowers white, in compound umbels. Bracts entire or none. Bractlets entire. Fruit ovate or oblong with filiform ribs. Oil-tubes solitary in the intervals. (Karon, Greek name of the caraway.)

Perennial herbs; native species.

Stems clustered, from a fascicle of coarse roots1. *C. kelloggii*.

Stems solitary, from a tuber or cluster of tubers2. *C. gairdneri*.

Annual or biennial herbs; garden plants.

Flowers white.....3. *C. carui*.

Flowers greenish-yellow.....4. *C. petroselinum*.

1. **C. kelloggii** Gray. Stems 8.6 to 14 dm. high; basal leaves 12 to 24 cm. long, ternate, each division pinnate with linear divisions; stem leaves smaller; bracts and bractlets lanceolate or subulate; rays 1.8 to 3.6 cm. long.—Dry open foothills.

2. **C. gairdneri** Gray. SQUAW ROOT. Stems 3 to 9 dm. high; leaves few, simply pinnate; leaflets 3 to 7, linear; upper leaves mostly simple; bracts 1 or 2 or none; bractlets few; fruit broadly oblong to elliptic.—Adobe flats or meadows or hill slopes.

3. **C. carui** L. CARAWAY. Stems 3 to 6 dm. high; leaves pinnate; leaflets filiform.—Cult. from Eur. for its seed-like fruits which are used in flavoring bread and cakes.

4. **C. petroselinum** Benth. PARSLEY. Leaves ternate-pinnate; leaflets ovate, 3-lobed or incised.—Cult. from Eur. for its pleasant-flavored foliage which is used for garnishing meats and fish.

12. **CICUTA** L. WATER HEMLOCK

Tall branching perennials. Leaves at least partially twice or thrice pinnate. Flowers white, in compound umbels. Fruit flattened laterally, broadly ovate to roundish; ribs corky, broad, low, the lateral largest. (Classical name of the hemlock, which was given to criminals and sometimes, when the Greeks had a superfluity, to philosophers, as a death poison.)

1. **C. douglasii** (DC.) C. & R. WESTERN WATER HEMLOCK. Stems stout, glaucous, 8.6 to 11.5 dm. high; herbage often purplish; leaves bipinnate, the leaflets sessile, lanceolate, serrate; fruit sub-orbicular, with light-colored ribs and red-brown intervals.—Along streams and in marshes in the mountains. Its root is poisonous to cattle.

13. **VELAEA** DC.

Subglabrous perennials with thick yellow elongated odorous tap roots. Leaves pinnately or ternately compound. Flowers in compound umbels.

Fruit oblong or orbicular, somewhat laterally compressed. Ribs acute or filiform, equal. Oil-tubes conspicuous. (Sebastin Eugene Vela, student of the Umbelliferae.)

Leaves simply pinnate; ribs of the fruit prominent.....1. *V. arguta*.
Leaves ternate; ribs of the fruit inconspicuous.....2. *V. hartwegii*.

1. *V. arguta* (Nutt.) C. & R. Plants 3 to 7 dm. high; leaves 4.8 to 12 cm. long; leaflets 5 to 7, ovate, serrate; fruit oblong, its ribs acute, prominent.—Mountains of coastal S. Cal.

2. *V. hartwegii* (Gray) C. & R. Plants tufted, 2.8 to 8.6 dm. high; leaflets ovate or oblong, sparingly incised, serrate, mucronate; fruit nearly orbicular, the ribs slender, inconspicuous.—Foothills, cent. Cal.

14. FOENICULUM Hill

Stout perennial with aromatic herbage. Leaves decompose into numerous filiform segments. Flowers in large compound umbels. Fruit oblong, with prominent ribs and oil-tubes solitary in the intervals. (Diminutive of Latin foenum, hay, from its odor.)

1. *F. vulgare* (L.) Gaertn. SWEET FENNEL. Stems striate, branching, 8.6 to 20 dm. high; herbage glaucous.—Nat. from Eur.; waste places on old farms and by country lanes.

15. HERACLEUM L.

Tall stout perennial with very large compound leaves with 3 leaflets. Flowers white, in a large compound umbel, those near the margin of the umbel with larger corollas. Fruit almost round, strongly flattened, with 5 longitudinal ribs on the back of each half. Oil-tubes 1 to each interval between the ribs, visible from the outside. (Named for Hercules, who it is said, first used it as a medicine.)

1. *H. lanatum* Michx. Cow PARSNIP. Fig. 4. Moist north hillsides near the coast.

16. LOMATIUM Raf.

HOG-FENNEL

Low perennials with thick tap-roots, the leaves mostly basal and the stems scape-like. Flowers white or yellow, in compound umbels. Bracts usually none. Bractlets usually present. Fruit nearly round to oblong, much flattened, with 5 ribs on the back of each half, the lateral ribs winged, the others appearing as ridges. (From Greek loma, a border, referring to the winged fruit.)

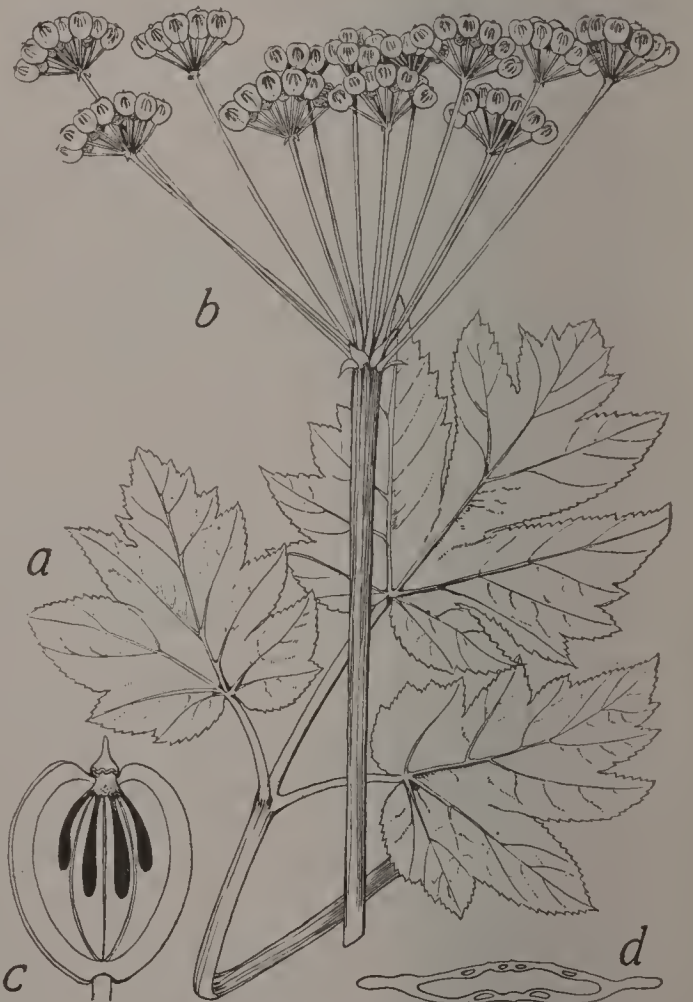


Fig. 4. *Heracleum lanatum* Michx.: a, leaf $\times \frac{1}{8}$; b, umbel $\times \frac{1}{4}$; c, carp. $\times 2$; d, sect. of carp. $\times 3$.

(From Greek loma, a border, referring to

Peduncles not enlarged at summit.

Wings on each side of the body of the seed more or less distinct; leaflets more or less broad.....1. *L. lucidum*.

Wings more or less joined above and below the body of the seed; leaves dissected into numerous very small segments.

Bractlets broad, roundish or obovate.

Oil-tubes none in the intervals; wings thickish.....2. *L. caruifolium*.

Oil-tubes solitary in the intervals; wings thin.....3. *L. utriculatum*.

Bractlets narrow, most often lanceolate.

Fruit glabrous; corolla glabrous.....4. *L. macrocarpum*.

Fruit pubescent; corolla with kinky white hairs.....5. *L. dasycarpum*.

Peduncles enlarged at summit.....6. *L. nudicaule*.

1. ***L. lucidum*** (Nutt.) Jepson. Plants 1.4 to 4.3 dm. high, the stout peduncles from very short stems; leaves once or twice ternate; leaflets roundish to ovate, toothed; rays 2.4 to 7.2 cm. long; bractlets lanceolate; oil-tubes solitary in the intervals.—Coastal S. Cal.

2. ***L. caruifolium*** (T. & G.) C. & R. Stem almost none, the peduncles three or four, 2 to 3 dm. high; leaves ternately dissected into small linear segments, finely hispid; fruiting rays 2.4 to 3.6 cm. long; bracts none; bractlets several; wings of fruit half to almost as wide as body; oil-tubes none or indistinct.—Low subsaline soils.

3. ***L. utriculatum*** (T. & G.) C. & R. **BLADDER PARSNIP.** Plants 2.4 to 3.8 dm. high, the proper stems short; leaves triternately dissected into small linear segments; fruiting rays 2.4 to 7.2 cm. long; bracts 1 to 3; bractlets several, scarious-margined; wings scarcely as wide as body of fruit; oil-tubes mostly solitary in the intervals.—Common on open hillsides.

4. ***L. macrocarpum*** (Nutt.) C. & R. Plants 2.8 to 4.3 dm. high, the stems several from a stout tap root; leaves twice ternate and twice pinnately divided, the ultimate segments linear, 2 to 6 mm. long and about 1 mm. wide; ultimate divisions of rachis winged; fruiting rays 3.6 to 4.8 cm. long; fruit glabrous, 12 to 16 mm. long, 4 to 8 mm. broad; oil-tubes solitary in the intervals.—Dry hillsides.

5. ***L. dasycarpum*** (T. & G.) C. & R. Plants 3 to 4.3 dm. high, the peduncles arising from the root-crown or from very short stems; leaves triternately decomposed and dissected into linear or oblong segments, these 2 to 4 (or 6) mm. long; rays 2.4 to 4.8 cm. long; bractlets linear to ovate; fruit broadly elliptic to orbicular, 7 to 8 (or 14) mm. long, the thin wings 2 to 3 times the width of the body; oil-tubes usually 1 (rarely 2) in the intervals.—Coastal S. Cal. and n. in the Coast Ranges.

6. ***L. nudicaule*** (Pursh.) C. & R. **PESTLE PARSNIP.** Plants 1.9 to 4.8 dm. high; leaves once or twice ternate, then pinnate; leaflets broadly ovate to lanceolate, entire; rays very unequal; fruit oblong to elliptic, wings half as wide as the body; oil-tubes 1 or 2 in the intervals.—Low open foothills and rolling plains.

17. PASTINACA L.

Tall branching biennial with angular stems from thick roots. Leaves large, simply pinnate. Flowers yellow, in compound umbels. Bracts and bractlets small or none. Fruit oval, compressed. Lateral ribs winged, the others filiform. Oil-tubes solitary in the intervals. (Latin name of the parsnip.)

1. **P. sativa** L. COMMON PARSNIP. Erect, 8.6 to 11.5 dm. high; leaflets ovate, serrate, incised, lobed or more or less divided; rays 2.4 to 6 cm. long; oil-tubes conspicuous.—Cult. from Eur. for the esculent roots; locally naturalized.

18. ANETHUM L.

Slender annuals with leafy stems and finely dissected leaves. Flowers yellow, in compound umbels. Bracts and bractlets none. Fruit elliptical, flattened dorsally, the lateral ribs narrowly winged. Oil-tubes solitary in the intervals. (Ancient Greek name of the dill.)

1. **A. graveolens** L. DILL. ANISE. Plants branching, 2.8 to 8.6 dm. high.—Garden plant from Eur.; also locally naturalized in S. Cal. The seed-like fruits are used as seasoning in cooking.

19. ANGELICA L.

Stout perennials with leafy stems and ternately or pinnately compound leaves. Flowers white, in large terminal compound umbels. Bracts and bractlets none or scanty. Fruit compressed, elliptic-oblong; lateral ribs broadly winged, the others often narrowly winged. Oil-tubes 1 to 3 in the intervals. (Latin angelica, on account of its medicinal properties.)

1. **A. tomentosa** Lindl. Stems stout, 5.5 to 14.5 dm. high; herbage more or less tomentose; leaflets 7.2 to 9.6 cm. long; rays 2.4 to 14.4 cm. long.—San Diego Co. to Mendocino Co.

ERICACEAE. HEATH FAMILY

Trees, shrubs or perennial herbs with simple leaves and regular flowers with the parts commonly in 5s. Stamens free from the corolla, as many or twice as many as its lobes or petals. Anthers opening by a terminal hole or chink. Ovary 3 to 10-celled. Fruit a pod or berry.—About 1400 species, very generally distributed.

Corolla choripetalous; fruit a pod; flowers in umbel-like clusters.....1. LEDUM.
Corolla sympetalous.

Calyx-tube free from the ovary.

Corolla funnelform; fruit a pod.....2. RHODODENDRON.

Corolla urnshaped; fruit berry-like.

Trees; berry with a rough surface.....3. ARBUTUS.

Shrubs.

Fruit a dry berry with a smooth or merely glandular surface.....

4. ARCTOSTAPHYLOS.

Fruit consisting of the pod inclosed in the enlarged and berry-like calyx.....5. GAULTHERIA.

Calyx-tube adherent to the ovary; fruit a berry.....6. VACCINIUM.

1. LEDUM L. LABRADOR TEA

Low shrubs with fragrant herbage and numerous small white flowers in umbel-like clusters. Petals spreading, distinct. Stamens 4 to 10. Fruit a 4-celled pod, splitting from the base upward. (Greek ledon, ancient name of the cistus.)

1. **L. glandulosum** Nutt. Evergreen, 5 to 14 dm. high; leaves oblong, acute at each end, rather thickly clothing the stems, the under surface often with a close glandular-dotted felt; petals 5 to 6 mm. long; pod oval, 4 mm. long.—Marin Co. and n.; high Sierra Nevada.

2. RHODODENDRON L.

Shrubs with entire leaves. Flowers in umbels or corymbs. Calyx very small. Corolla funnelform. Fruit a capsule. (Greek rhodos, rose, and dendron, a tree.)

1. **R. occidentale** Gray. WESTERN AZALEA. Deciduous shrub 1 to 2.3 m. high; leaves obovate, 2.4 to 9.6 cm. long; flowers white, rarely pinkish; corolla 3.6 to 4.8 cm. long, the upper lobe with a yellow splotch; stamens 5, exserted.—Stream banks in cañons.

2. **R. californicum** Hook. ROSE BAY. Evergreen shrub 1.5 to 4 m. high; leaves leathery, oblong or elliptic, 7.2 to 9.6 cm. long; flowers rose-purple; corolla 3 cm. long, the upper lobe greenish-dotted; stamens 10, included.—Near the coast, Santa Lucia Mts. n. to Del Norte Co.

3. ARBUTUS L. ARBUTE TREE

Trees with evergreen coriaceous leaves and white flowers in an ample terminal panicle of dense racemes. Corolla globular or ovate. Anthers 2-awned on the back. Fruit a many-seeded berry with a rough surface. (Latin name of the Arbuté tree under which, says Horace, idle men delight to lie.)

1. **A. menziesii** Pursh. MADROÑO. Tree 8 to 28 m. high; bark at first satiny green, turning to yellow or salmon-color, and finally aging to deep red; leaves elliptic or ovate, 4.8 to 12 cm. long; berries fleshy, 4 to 10 mm. in diameter.—Hillsides or mountain slopes. It is a highly ornamental tree. The berries were used as food by the native tribes.

4. ARCTOSTAPHYLOS Adans. MANZANITA

Evergreen shrubs with crooked branches, dark red smooth and polished bark. Leaves more or less vertical by twisting of the petiole. Flowers white or pink, disposed in a sub-globose panicle of short spikes or racemes. Corolla urnshaped. Anthers 2-awned on back. Fruit a dry brown or red "berry" with several stony nutlets, the nutlets either distinct or more or less consolidated. (Greek arktos, a bear, and staphule, a grape; bears feed on the berries.)

Ovary glabrous; leaves and branchlets glabrous or essentially so.

Stems several from a heavy root-crown which crown-sprouts freely; pedicels glandular; foliage very white-glaucous.

Berry with solid stone; S. Cal. and South Coast Ranges.....1. *A. glauca*.

Berry with separate nutlets; Sierra Nevada foothills chiefly....2. *A. viscida*.

Stems solitary, not enlarged at base, not crown-sprouting; pedicels not glandular or only obscurely or minutely so; foliage green...3. *A. manzanita*.

Ovary pubescent; leaves and branchlets pubescent or usually so; flowers white.

Stems solitary, not enlarged at base, not crown-sprouting.

Leaves mostly 8 to 14 mm. long; berry glabrous; nutlets thin-shelled.....

4. *A. sensitiva*.

Leaves mostly 2.4 to 4.8 cm. long; berry microscopically white-hairy; nutlets thick-shelled.....5. *A. columbiana*.

Stems several from a heavy root-crown, freely crown-sprouting; leaves mostly 2.4 to 3.6 (or 4.8) cm. long; berry minutely short-hairy; nutlets thick-shelled.

Bark not shreddy.

Branchlets not hispid; ovary not glandular.....6. *A. canescens*.

Branchlets or some of them more or less hispid; ovary hairs glandular.....7. *A. glandulosa*.

Bark markedly shreddy.....8. *A. tomentosa*.

1. *A. glauca* Lindl. GREAT-BERRIED MANZANITA. Robust shrub 2 to 4 m. high; leaves roundish to elliptical or broadly ovate, 3 to 4.2 cm. long; flowers white; nutlets consolidated into a single stone; berry 10 to 16 mm. broad.—Mt. Diablo to S. Cal.

2. *A. viscida* Parry. WHITE-LEAF MANZANITA. Shrub 1 to 3 m. high; leaves elliptic to orbicular, 1.8 to 3.6 cm. long; pedicel glandular-hairy; branchlets and peduncles very glaucous; flowers light pink; berry deep red, 6 to 8 mm. broad.—Sierra Nevada and inner n. Coast Range foothills.

3. *A. manzanita* Parry. PARRY MANZANITA. Large shrub 2 to 5 m. high; branchlets finely puberulent; leaves elliptic to oblong, 2.4 to 3.6 cm. long; flowers white; berry 8 to 10 mm. broad.—Dry hills and mountains. The berries are used in making jellies, while the wood, which is used for fuel, has a very high heat value.

4. *A. sensitiva* Jepson. FIRE MANZANITA. Slender erect shrub 5.7 to 14 dm. high; leaves roundish, abruptly acute or apiculate, finely reticulate-veiny beneath, 10 to 14 (or 20) mm. long; berry oblong, 4 mm. long.—Mt. Tamalpais; Santa Cruz Mts.

5. *A. columbiana* Piper. Shrub 1.5 to 2 m. high; branchlets bristly and also finely tomentose and usually glandular, very foliaceous; leaves ovate to oblong, obtuse to subcordate at base, 2.4 to 4.8 cm. long; berry depressed, 6 to 8 mm. broad.—Along the coast, Marin Co. n.

6. *A. canescens* Eastw. Whitish shrub 8.6 to 17 dm. high; leaves ovate; branchlets, peduncles and leaves minutely white-pubescent; ovary woolly.—Humboldt Co. to the Santa Cruz and Santa Lucia mountains.

7. *A. glandulosa* Eastw. EASTWOOD MANZANITA. Low shrub, commonly 5.7 to 8.6 dm. high; branchlets, peduncles and pedicels with a dusky more or less glandular tomentum; leaves ovate to elliptic, 2.4 to 4.2 cm. long; ovary glandular-hairy.—On broken sandstone, San Diego Co. and San Gabriel Mts., n. to Mendocino Co.

8. *A. tomentosa* (Pursh) Lindl. Similar to no. 7; leaves rather densely tomentose beneath.—Monterey Co.

5. GAULTHERIA L.

Shrubby evergreen plants with spicy aromatic leaves and flowers in a raceme. Calyx 5-cleft. Corolla oval-urnshaped, 5-toothed at the narrow orifice. Stamens 10, each anther with pair of spreading awns at summit. Ovary 5-celled. Pod inclosed by the enlarged and fleshy calyx. (Dr. Gaultier, Canadian physician and botanist.)

1. *G. shallon* Pursh. SALAL. Stems erect, 8 to 20 dm. high; leaves ovate or orbicular, finely serrate; pedicels declined; corolla pink or pinkish-white, 8 mm. long; fruit purple or black.—Abundant in forests of the Redwood belt.

6. VACCINIUM L.

Bushes. Calyx-tube adnate to the ovary, the limb 5-lobed. Corolla globular or urnshaped, 5-toothed. Anthers commonly 2-awned on the back, each cell prolonged into a tube opening at the tip by a pore. Fruit a berry crowned with the vestiges of the calyx-teeth. (Classical Latin name of the bilberry.)

1. *V. ovatum* Pursh. CALIFORNIA HUCKLEBERRY. Evergreen shrub

11 to 17 dm. high; leaves leathery, oblong-ovate, serrate, short-petioled, 1.2 to 3 cm. long; corolla pink; berry dark purple, without bloom.—North hill slopes near the coast.

PRIMULACEAE. PRIMROSE FAMILY

Low herbs with simple entire leaves and regular and symmetrical flowers. Sepals, petals and stamens commonly 5 (4 to 8). Stamens opposite the lobes of the corolla and inserted on its tube or base. Ovary commonly superior, 1-celled, with a single style and stigma. Fruit a capsule.—Species about 320, of wide distribution, but most abundant in the north temperate zone.

Corolla with rotate lobes; stamens distinct.

Stem commonly branching; leaves opposite or ternate.....1. *ANAGALLIS*.

Stem simple with a whorl of large leaves at summit.....2. *TRIENTALIS*.

Corolla with reflexed lobes; leaves all basal; stamens with filaments united at base..
3. *DODECATHEON*.

1. ANAGALLIS L. PIMPERNEL

Annual. Leaves opposite or sometimes in 3s. Flowers axillary and solitary, on slender pedicels. Calyx 5-cleft. Corolla rotate, deeply 5-parted into rounded lobes. Stamens 5. Filaments hairy. Pod opening by a lid. (Greek *anagallis*, delightful.)

1. *A. arvensis* L. POOR MAN'S WEATHER GLASS. Leaves triangular-ovate, acute, sessile, about 8 mm. long; shorter than the pedicels; corolla vermilion, 8 to 10 mm. broad; pods on recurved pedicels.—Waste places about towns; nat. from Eur. The flowers open only in sunshine.

2. TRIENTALIS L.

Stem simple, from tuberous rootstocks, bearing scales or small leaves below and a whorl of large leaves above, from the center of which the filiform peduncles arise. Parts of the flower in 6s, sometimes 5s or 7s. Corolla rotate, deeply parted. Filaments long, united at base into a short ring. Valves of the pod 5. (Latin *trientalis*, containing one-third of a foot, in allusion to the height of the plants.)

1. *T. europaea* L. var. *latifolia* Torr. STAR-FLOWER. Stem 9.6 to 14.4 cm. high; leaves of the whorl 5 or 6, broadly obovate, abruptly acute, 2.4 to 4.8 cm. long; corolla red or white, about 8 mm. broad, its divisions abruptly acute and prolonged into a slender point.—Coast Range woods.

3. DODECATHEON L.

Glabrous herbs with basal leaves and a naked stem bearing an umbel of several flowers. Calyx 5-cleft. Corolla commonly 5-parted, with very short tube, the narrow divisions reflexed. Stamens 5. Filaments short and flat, united at least below. Fruit a pod surrounded by the now erect calyx, opening by a lid. (Greek *dodeka*, 12, and *theos*, god, the primrose being under the care of the deities.)

Root-crown with rice-grain bulblets; herbage glabrous, the summit of the scape and the pedicels rarely microscopically glandular.....1. *D. hendersoni*.

Root-crown without rice-grain bulblets, at least before flowering.
Herbage glabrous; anthers 2 mm. long, the connectives delicately rugulose.....
2. *D. patulum*.

Scapes and pedicels minutely glandular; anthers 4 mm. long, the connectives strongly rugose.....3. *D. clevelandi*.

1. **D. hendersoni** Gray. SAILOR'S CAPS. MOSQUITO BILLS. Stem 2 to 3 dm. high; leaves elliptic, the margins often crisped; umbels 3 to 13-flowered; the pedicels 1.2 to 8.4 cm. long; parts of the flowers sometimes in 4s; petals purple with a transverse yellow band at base which is edged above by white and bounded below by a black-purple area.—Mountains and low hills.

2. **D. patulum** Greene. SHOOTING STAR. Similar to no. 1; 7 to 9.6 cm. high; corolla white or pale cream-color.—Alkaline plains of the Sacramento and San Joaquin.

3. **D. clevelandi** Greene. Stems 2.8 to 5.7 dm. high; corolla bright purple with a yellow base and some dark purple spots next the stamens.—S. Cal.

PLUMBAGINACEAE. THRIFT FAMILY

Maritime herbs. Stems scapose, naked, commonly hard or coriaceous, with the leaves in a basal tuft. Flowers regular, perfect, 5-merous throughout. Calyx tubular or funnel-form, plaited. Petals with long claws barely united into a ring at base or distinct. Stamens 5, opposite the petals, adnate to the base of the claw. Ovary superior, 1-celled; ovule 1; styles 5. Fruit a utricle or achene, borne in the base of the persistent calyx.—Species about 325, all continents.

Leaves narrowly linear; scapes terminating in a globose head of flowers.....
 Leaves broad; scapes terminating in a panicle.....

1. STATICE.

2. LIMONIUM.

1. STATICE L. THRIFT

Leaves narrowly linear, sedge-like, in a close tuft. Heads composed of numerous crowded clusters. Calyx scarious. Styles united at the very base. (Greek statike, astringent.)

1. **S. arctica** Blake var. **californica** Blake. SEA-PINK. Scapes 1.6 to 4.8 dm. high, few or solitary; leaves involute-channeled, 1 to 2 dm. long; flowers dull pink or flesh-color; calyx-tube 10-nerved, the nerves densely hispid.—Seabeaches or sandy fields along the ocean from Monterey Co. to Del Norte Co.

2. LIMONIUM Hill. MARSH ROSEMARY

Leaves broad, fleshy. Flowers secund, in short spikes or clusters terminating the many branchlets of a branching scape. Calyx hairy on the angles below. Styles wholly distinct. (Greek leimon, meadow.)

1. **L. californicum** Hel. Scapes 2.2 to 4.3 dm. high, loosely paniculate; leaves obovate- to oblong-spatulate, obtuse or sometimes retuse, tapering into a rather long petiole, 1 to 2.2 dm. long; flowers violet-purple; petals oblong, narrowed towards the base, 4 to 5 mm. long.—Salt marshes and seabeaches along the coast.

EBENACEAE. EBONY FAMILY

Deciduous trees or shrubs. Flowers regular. Calyx and corolla 3 to 7-lobed, usually 4-lobed. Stamens usually 8 to 16. Ovary superior, 4 to 12-celled; styles 2 to 6. Fruit a large berry, bearing the enlarged calyx at the base.—Species 250, chiefly tropical.

1. DIOSPYROS L.

Foliage lustrous, handsome. Calyx and corolla more or less leathery. (Greek dios, Jove, and pyros, grain, on account of the edible fruit.)

1. *D. virginiana* L. COMMON PERSIMMON. Branchlets usually glabrous; leaves acuminate; berry smooth, 1.2 to 3.6 cm. broad, not ribbed.—Cult. from the eastern U. S. As a winter fruit the dead ripe berry is wonderfully delicious, but when green it is puckery beyond all saying.

2. *D. kaki* L.f. JAPANESE PERSIMMON. Branchlets appressed brownish-pubescent; berry usually ribbed, 3.6 to 7.2 cm. broad.—Cult. from Japan, two of the favored commercial varieties being Hachiya and Fuyu.

OLEACEAE. OLIVE FAMILY

Trees or shrubs with opposite leaves. Calyx 4-cleft or none. Corolla regular, 4-cleft or 2-petalous or none. Stamens 2. Ovary superior, 2-celled, becoming a dry winged fruit or a drupe.—About 400 species of temperate and tropical lands.

Leaves simple; fruit a drupe.....1. OLEA.
Leaves pinnately compound; fruit a samara.....2. FRAXINUS.

1. OLEA L.

Evergreen trees with simple leaves. Flowers perfect. Corolla short, white, 4-cleft. Fruit a drupe with a hard stone. (Classical name for the olive.)

1. *O. europaea* L. OLIVE. Leaves lanceolate or somewhat oblong, pale, entire, whitish-scurfy beneath; fruit oblong, edible, oily.—Cult. from the Levant. The olive has been grown as a food plant from ancient times. The Romans valued it highly and dedicated the tree to the goddess Minerva. In Cal. the crop averages about 4000 to 8000 tons a year.

2. FRAXINUS L. ASH

Deciduous trees or shrubs with pinnately compound leaves. Flowers small, in crowded panicles, appearing in spring before the leaves, either perfect or with the staminate and pistillate on different plants. Corolla none or consisting of 2 distinct petals. Fruit a flattened body with a long wing at apex. (The Latin name of the ash.)

Tree; flowers dioecious; corolla none; style conspicuously 2-lobed.....1. *F. oregana*.
Shrub; flowers perfect; corolla present; style obscurely lobed.....2. *F. dipetala*.

1. *F. oregana* Nutt. OREGON ASH. Tree 8 to 22 m. high; leaflets 5 to 7, 5.1 to 12.2 cm. long; petals none; fruit 3.2 to 5.1 cm. long.—Moist valley flats, river banks and cañon streams. The wood is hard, coarse-grained and strong; it is used for wagon parts and implement handles.

2. *F. dipetala* H. & A. MOUNTAIN ASH. Shrub 1 to 3 m. high; leaflets 3 to 9, 1.9 to 3.8 cm. long; petals 2, white, distinct; fruit 2.5 to 3.2 cm. long.—Cañons and mountain slopes.

GENTIANACEAE. GENTIAN FAMILY

Glabrous herbs. Leaves opposite, simple, sessile. Flowers perfect, regular, 5 or 4-merous. Stamens inserted on the tube of the corolla, as many as its lobes. Ovary superior, 1-celled; style 1 or none; stigmas 2.—Species about 600, distributed over the entire earth, but mostly alpine.

1. **CENTAURIUM** Hill. CANCHALAGUA

Low erect leafy annuals. Flowers red or pink, in cymes. Calyx deeply parted. Corolla salverform. (Latin centum, a hundred, and aurium, gold piece, certain species valued medicinally.)

1. **C. venustum** Rob. Stems 1 to 2 dm. high, almost simple; corolla vermilion or rose-color, the throat white, marked with 5 red spots or crescents; stigmas spatulate-fan-shaped.—S. Cal., Sierra Nevada. An infusion of the herbage is used in rural medicine as a cure for malaria.

2. **C. trichanthum** Rob. Similar to no. 1 but rather densely branched, with numerous flowers; stigmas short, not spatulate.—Dry open alkaline ground.

APOCYNACEAE. DOGBANE FAMILY

Herbs or shrubs with milky acrid juice. Leaves opposite or whorled, simple, entire. Flowers regular, 5-merous. Corolla twisted in the bud. Anthers conniving around the stigma. Pistils 2, superior, separate, but the stigmas united. Seeds with a silky or downy tuft.—Species 1000, principally tropical. The milky juice has poisonous properties.

1. **APOCYNUM** L. INDIAN HEMP

Flowers small. Corolla bell-shaped with 5 appendages inside. Stamens 5, inserted deep in the corolla. Filaments very short. Style none. (Greek apo, from, and kuon, dog, ancient name of the Dogbane.)

1. **A. androsaemifolium** L. var. **pumilum** Gray. MOUNTAIN HEMP. Low herb, branches spreading; leaves oval or ovate, mucronate, greenish above; cymes loose; flowers white or pink; corolla-lobes revolute.—Half-open brushy or wooded slopes.

2. **A. cannabinum** L. COMMON INDIAN HEMP. Tall herb, the branches erect or nearly so; leaves ovate to lance-oblong; cymes dense; flowers greenish-white; corolla-lobes nearly erect.—Banks of streams. The fibre was used by the Indians for cords.

2. **NERIUM** L.

Evergreen shrub. Leaves narrow, leathery. Flowers rose-like, showy, in terminal cymes. Throat of corolla-tube crowned by 5 teeth. Anthers 2-tailed at the base and tapering at the apex into a long thread-like appendage. (Ancient name for Oleander, perhaps from Greek neros, moist, on account of its wild habitats.)

1. **N. oleander** L. OLEANDER. Leaves in 2s or 3s, lanceolate; segments of crown 3 or 4-toothed.—Cult. from the Levant.

ASCLEPIADACEAE. MILKWEED FAMILY

Perennial herbs with milky juice. Leaves opposite or whorled. Flowers cymose, regular. Styles distinct below but united above. Stamens 5, united into a tube which is blended above with the styler column, the united filaments (filament-column) and united anthers (anther-column), here called the stamen-column, bearing hoods. Seeds with a silky tuft of hairs.—Species about 1800, all continents.

1. **ASCLEPIAS** L. MILKWEED

Commonly erect. Calyx and corolla 5-parted, the divisions reflexed.

Follicles ovate or lanceolate. (Greek name of the European swallow-wort, a plant of this family.)

Horns present on the hoods of the stamens.

Hoods equalling or shorter than the anther-column.

Leaves broad; filament-column very short or almost none; herbage hoary-tomentose.....1. *A. eriocarpa*.

Leaves narrow; filament-column about as long as the anther-column; herbage glabrous.....2. *A. mexicana*.

Hoods twice or thrice as long as the anther-column; filament-column very short or none.....3. *A. speciosa*.

No horns to the hoods of the stamens; herbage glabrous.....4. *A. cordifolia*.

1. ***A. eriocarpa*** Benth. Stem 4.3 to 8.6 dm. high; leaves broadly oblong, 9.6 to 21.6 cm. long, short-petioled; umbels clustered toward the summit; flowers 7 mm. long; corolla creamy-white; hoods pinkish.—Dry barren valleys of the Coast Range and Sierra Nevada foothills. From the bast fibres Indians made rope, bow-strings and squaw headbands for carrying burdens. White women settlers use the silky coma of the seeds as floss for scent-bags, finding it superior to cotton. The herbage is said to poison sheep.

2. ***A. mexicana*** Cav. NARROW-LEAF MILKWEED. Stem slender, 5.8 to 14 dm. high; leaves 6 to 14.4 cm. long; umbels many, many-flowered; flowers greenish-white or tinged with purple.—Dry ground, valleys. Sometimes it becomes a weed in cult. fields or orchards.

3. ***A. speciosa*** Torr. CREEK MILKWEED. Stem stout, 5.8 to 13 dm. high, leafy to the top; herbage soft-tomentose; leaves opposite, transversely veined, 9.6 to 14.4 cm. long; petals pink or reddish-purple; hoods yellowish.—Valley flats and along streams.

4. ***A. cordifolia*** (Benth.) Jepson. PURPLE MILKWEED. Stems 4.3 to 5.8 dm. high; leaves mostly opposite, ovate-lanceolate, cordate-clasping, 4.8 to 9.6 cm. long; corolla dark purple; hoods purplish.—Open slopes.

CONVOLVULACEAE. MORNING GLORY FAMILY

Chiefly twining or trailing herbs, rarely with woody stems. Leaves alternate. Flowers regular, the parts in 5s, except the superior ovary which is commonly 2-celled. Sepals distinct, imbricated. Corolla showy, funnelform or campanulate, plicate and twisted in the bud. Styles 1 or 2. Fruit a capsule.—Species about 1100, all regions except the arctic zones.

Stigmas filiform or ovate.....1. CONVULVULUS.
Stigmas capitate.....2. IPOMAEA.

1. CONVULVULUS L. BINDWEED

Stems twining, or trailing over the ground. Style 1, stigmas 2. Capsule globose, 4-seeded. (Latin *convolo*, to entwine.)

Calyx not inclosed by bracts; corolla purplish outside.

Stems herbaceous, prostrate; bracts distant twice or at least more than their length below calyx; corolla white.....1. *C. arvensis*.

Large woody climbers; bracts inserted less than their length below the calyx; corolla purplish-white.....2. *C. luteolus*.

Calyx embraced by a pair of broad bracts; corolla white or cream-color.

Herbage glabrous or nearly so; peduncles 4.8 to 9.6 cm. long, greatly surpassing the leaves.....3. *C. occidentalis*.

Herbage pubescent or villous; peduncles shorter than the leaves.

Leaves thin, slightly hairy; low tufted plants; leaves and peduncles basal.....
4. *C. subacaulis*.

Leaves thick, covered with a dense villous pubescence; low trailing plants;
leaves and peduncles basal and borne along the stem.....
5. *C. villosus*.

1. *C. arvensis* L. ORCHARD MORNING GLORY. Stems 2.8 to 11.5 dm. long; leaves oblong- or triangular-sagittate; peduncles with a pair of subulate or spatulate bracts near the middle; corolla 2.4 to 3.6 cm. long.—A great pest in cult. fields and orchards; nat. from Eur.

2. *C. luteolus* Gray. Climbing over shrubs and bushes, 1 to 5 m. high; leaves sagittate at base, the basal lobes very variable; bracts oblong or lanceolate, corolla 2.4 to 3.6 cm. long, the limb scarcely angular.—Foothills, cent. and n. Cal.

3. *C. occidentalis* Gray. Stems freely twining, 5 to 12 dm. long; leaves usually triangular-ovate, acuminate at apex, cordate-sagittate to hastate at base, the basal lobes often 1 or 2-toothed; corolla white or pinkish, 2.4 to 3.6 cm. long.—Coastal S. Cal.

4. *C. subacaulis* (H. & A.) Greene. Stems 2.4 to 36 cm. long, trailing over the ground; herbage green; leaves ovoid or deltoid, hastate or truncate at base, 2.4 cm. long; corolla angularly 5-lobed, 3.6 to 4.8 cm. long.—Dry hills, Napa Co. and s.

5. *C. villosus* (Kell.) Gray. Similar to no. 4, but the whole plant white with a velvety tomentum.—Dry slopes.

2. IPOMAEA L. MORNING GLORY

Similar to *Convolvulus* but style entire. (Greek ips, bindweed, and homoios, like.)

1. *I. batatas* Poir. SWEET POTATO. Stems creeping, long and smooth, the roots producing large tubers with yellow flesh; leaves heart-shaped to triangular; flowers purple; capsule with four 1-seeded cells.—Cult. from trop. Am. for the tubers, which when properly baked are inexpressibly delicious. Yam is a cult. variety with usually larger tubers and white flesh.

POLEMONIACEAE. GILIA FAMILY

Mostly herbs with the parts of the flower in 5s except the superior ovary, which is 3-celled. Stamens inserted on the corolla alternate with its lobes, often unequal in length. Style 3-cleft. Fruit a 3-valved capsule.—About 200 species, principally N. Am.

Calyx replicate in sinus; sinus distended in age into a revolute lobe....1. COLLOMIA.
Calyx neither replicate nor distended in sinus.

Leaves pinnately parted, lobed or divided, or entire, alternate or, when opposite, oblong-lanceolate.....2. GILIA.

Leaves palmately lobed or divided or, when entire, linear and opposite.....
3. LINANTHUS.

1. COLLOMIA Nutt.

Herbs with alternate entire or pinnate leaves. Flowers in dense bracteate clusters. Calyx scarious below the sinuses which finally enlarge into a distinct recurved lobule. Corolla tubular-funnelform or salverform. Seeds 1 to several in each cell, becoming mucilaginous when moistened. (Greek kolla, glue, on account of the mucilaginous seeds.)

1. *C. heterophylla* Hook. Erect or diffusely branching, 4.8 to 24 cm. long; upper leaves entire or toothed, lower pinnately parted into acute divisions; flowers in terminal clusters subtended by entire or deeply toothed bracts; corolla red-purple.—Shady places in the mountains.

2. **GILIA** R. & P.

Herbs with mostly alternate entire or variously lobed or dissected leaves. Flowers either scattered, or in loose or head-like clusters. Calyx scarious below the sinuses, its teeth equal, the tube in some species ruptured in age by the growing pod. Corolla funnelliform to salverform. Seeds 1 to several in each cell of the pod. (Felipe Luis Gil, Spanish botanist of the latter half of the 18th century.)

Calyx segments equal, entire.

Leaves opposite, entire.....1. *G. gracilis*.
Leaves alternate.

Leaves mostly 1 to 3 times pinnately dissected into narrow segments.

Stamens included; flowers few in mostly loose clusters.

Flowers 1-colored.

Tube of corolla shorter than calyx; flowers blue or purple....

2. *G. multicaulis*.

Tube of corolla longer than calyx; flowers scarlet.....

3. *G. aggregata*.

Flowers 3-colored, blue, purple, and yellow.....4. *G. tricolor*.

Stamens more or less exerted; flowers in terminal capitate clusters.

Corolla-segments nearly linear.....5. *G. capitata*.

Corolla-segments obovate or oblong.....6. *G. achilleaefolia*.

Leaves or their simple divisions linear or filiform and rigid; calyces and bracts densely woolly-matted.

Leaves 1 to 3-parted.....7. *G. virgata*.

Leaves 3 to 7-parted.....8. *G. brauntonii*.

Calyx segments mostly unequal, entire or some toothed; flowers blue.....

9. *G. squarrosa*.

1. *G. gracilis* Hook. Simple or branched above, 7.2 to 19.2 cm. high, pilose-pubescent; leaves opposite, oblong to lanceolate, entire; flowers in a terminal cyme; calyx cylindrical, distended in fruit; tube of corolla yellow, surpassing the calyx, its lobes roundish.—Foothills.

2. *G. multicaulis* Benth. Branching from the base, 2 to 3.3 dm. high, glabrous; leaves pinnately parted into linear lobes; flowers in few-flowered subsessile or loose clusters; corolla deep or pale blue, its lobes obovate.—Hills and valleys from Marin Co. and the Vaca Mts. s. to S. Cal.

3. *G. aggregata* Spreng. SCARLET GILIA. Erect, 2.8 to 8.6 dm. high; leaves pinnately parted into linear divisions; flowers in small clusters in a virgate panicle; calyx glandular, with subulate lobes; corolla from scarlet to pink or white.—Rocky ravines in the mountains.

4. *G. tricolor* Benth. BIRD'S EYES. Erect, 1 to 2.8 dm. high, usually branching above the base; leaves laciniately bipinnatifid; flowers few in mostly loose clusters; corolla 3-colored, blue, purple and yellow, 1.2 to 1.4 cm. long.—Low hills.

5. *G. capitata* Dougl. Erect, 5.7 to 8.6 dm. high; leaves several times palmately dissected into linear or filiform lobes; flowers in a globose cluster terminating a long slender naked peduncle; calyx nearly or quite glabrous, its teeth lanceolate; corolla pale blue, its lobes linear.—Hill country.

6. *G. achilleaefolia* Benth. Similar to no. 5 but flower-clusters larger

and less compact; calyx more or less woolly, the teeth triangular, acute; corolla blue, its lobes obovate or oblong.—Sandy soils.

7. *G. virgata* Steud. At first simple, then branched, 1 to 2 dm. high; lower leaves entire, upper 3-parted, the divisions filiform; flowers in small clusters virgately disposed; corolla light blue or whitish.—Monterey to S. Cal.

8. *G. brauntonii* Jepson & Mason. Simple or branched annual 2 to 4 dm. high; leaves pinnately parted into 3 to 7 filiform divisions; flowers in dense floccose heads; corolla vivid blue; stamens exerted beyond the tube, anthers sagittate.—S. Cal. (*G. virgata* Steud. var. *floribunda* Gray.)

9. *G. squarrosa* H. & A. SKUNKWEED. Erect, simple or branching, 2 to 3 dm. high, noxiously glandular; leaves once or twice pinnatifid, the segments lanceolate; calyx-teeth lanceolate, pungent, corolla blue.—S. F. Bay region and n.

3. LINANTHUS Benth.

Slender annuals with simple or dichotomously branching stems and opposite palmately divided or simple leaves. Flowers mostly scattered or in terminal capitate clusters. Corolla rotate to funnelform or salverform. Stamens included or exerted. Ovary with few to numerous ovules in each cell. (Greek *linon*, flax, and *anthos*, flower.)

Corolla funnelform, the throat equal to or longer than tube.

Flowers subsessile or on short stout pedicels.....1. *L. dichotomus*.

Flowers on capillary pedicels.

Leaves linear, entire; corolla-lobes serrate-margined....2. *L. dianthiflorus*.

Leaves palmately divided; corolla-lobes entire-margined.

Stems branching above the base; plants 10 to 40 cm. high.....

3. *L. liniflorus*.

Stems branching at the base, the branchlets filiform; plant 5 to 15 cm. high.....4. *L. filipes*.

Corolla salverform, the tube much longer than the throat.

Corolla not much exceeding the bracts, its lobes 2 to 3 mm. long.....

5. *L. ciliatus*.

Corolla much exceeding the bracts, its lobes 3 to 7 mm. long.

Corolla-lobes 3 to 4 mm. long; plants often very much branched from the base, slender.....6. *L. parviflorus*.

Corolla-lobes 5 to 7 mm. long; plants usually erect, stout.....

7. *L. androsaccus*.

1. *L. dichotomus* Benth. EVENING SNOW. Erect, 1 to 2 dm. high; nodes few and internodes very long; flowers terminal or in the forks, on short stout pedicels or sub-sessile; calyx-tube cylindrical, white-scarios between the ribs which are prolonged into long narrowly linear lobes; corolla white or nearly so, funnelform, its lobes obovate, strongly convolute in the bud, the limb 2.4 cm. broad; stamens included in the tube of the corolla, inserted below its middle, somewhat hairy at the very base.—Open slopes of high hills.

2. *L. dianthiflorus* Greene. Simple or diffusely branching, 2.4 to 14.4 cm. high; corolla pink, 1.2 to 1.8 cm. broad, the tube short and the lobes fringed.—Santa Barbara to San Diego.

3. *L. liniflorus* Greene. Plants erect, 2.8 to 5.7 dm. high, branching above; flowers white, in a diffuse panicle; corolla with nearly obsolete

tube, the limb rotate, 1 to 1.7 cm. broad; filaments with a hairy ring just above the base.—Plains and foothills.

4. *L. filipes* Greene. Diffusely branching, 4.8 to 12 cm. high, the branches filiform; calyx turbinate; corolla short-funnelform, with limb 4 to 6 mm. broad.—Sierra foothills.

5. *L. ciliatus* (Benth.) Greene. Stems rigid, commonly 9 to 14 cm. high; leaves scabrous; corolla deep rose-red, often fading white, 1.2 to 1.8 cm. long, commonly not exceeding the conspicuously hirsute-ciliate bracts; lobes of the corolla about 2 mm. long.—Wooded hills.

6. *L. parviflorus* Benth. Simple or branching, 7 to 26 cm. high; almost glabrous; bracts scabrous, not ciliate or scarcely so; corolla purple, pinkish, pale yellow or whitish, 1.8 to 3.6 cm. long, the lobes 4 to 6 mm. long, commonly reddish or brownish outside.—Hill and mountain slopes.

7. *L. androsaceus* Benth. Usually simple, 1.6 to 3.6 dm. high, more or less finely tomentose; bracts ciliate, otherwise nearly glabrous; corolla lilac, lavender, pink or white, 2.4 cm. long, the lobes 6 to 8 mm. long; throat commonly dark purple with yellow border.—Hill and mountain sides.

HYDROPHYLLACEAE. PHACELIA FAMILY

Herbs or shrubs with regular flowers, the parts in 5s except the 1 or 2-celled superior ovary. Flowers solitary and axillary, or in racemes or spikes which are commonly coiled. Styles 2 and distinct, or more or less completely united. Fruit a capsule.—About 170 species, mostly in temperate N. Am.

Leaves mainly opposite; herbs.

Calyx with a reflexed appendage at each sinus; flowers mostly solitary.....

1. NEMOPHILA.

Calyx without appendages; flowers in racemes.....2. ELLISIA.

Leaves alternate or basal.

Style 2-cleft; herbs.

Corolla blue or white, deciduous.....3. PHACELIA.

Corolla yellow, persistent.....4. EMMENANTHE.

Styles 2, distinct; shrubs with thick leaves.....5. ERIODICTYON.

1. NEMOPHILA Nutt.

Delicate low annuals. Leaves pinnate, all or at least the lowest opposite. Flowers mostly solitary on axillary peduncles. Calyx with a reflexed appendage in each sinus. Corolla rotate to broadly campanulate, with 10 internal appendages at base. (Greek *nemos*, grove, and *phileo*, to love.)

Stems with prickles; uppermost flowers clustered; petioles broadly winged.....

1. *N. aurita*.

Stems without prickles; flowers all solitary and axillary.

Flowers large; peduncles 2 to 4 times as long as leaves.....2. *N. menziesii*.

Flowers small; peduncles shorter than leaves.....3. *N. parviflora*.

1. *N. aurita* Lindl. CLIMBING NEMOPHILA. Stems weak and succulent, 4-angled, disposed to climb by the reflexed bristles which arm the angles; leaves deeply pinnatifid with mostly retrorse lobes, auricled at base; leaves above reduced and the flowers thus racemose; corolla dark violet, 16 to 22 mm. broad.—Oakland Hills to S. Cal.

2. *N. menziesii* H. & A. BABY BLUE EYES. Diffusely branching, 4.8

to 24 cm. high; corolla bright blue, or center white, or whole corolla pale and often dotted, 1.2 to 2.4 cm. wide.—Moist places in the valleys and on the hills. (*N. insignis* of authors.)

3. *N. parviflora* Dougl. SMALL-FLOWERED NEMOPHILA. Stems slender and weak, trailing or procumbent; leaves mostly pinnately 3 to 5-lobed but variable; corolla white or whitish, 4 to 10 mm. in diameter.—Wooded hills.

2. ELLISIA L.

Leaves pinnately 1 to 3 times parted or dissected. Flowers in axillary peduncled racemes. Calyx without appendages at the sinuses. Corolla white, campanulate, shorter or little longer than the calyx, the internal appendages minute or none. (John Ellis, English botanist of the 18th century.)

Leaves once pinnately parted; ovules 4, borne on the front of the placentae.....
 1. *E. membranacea*.
 Leaves twice to thrice pinnatifid; ovules 8, 2 on the back and 2 on the front of each placenta.....2. *E. chrysanthemifolia*.

1. *E. membranacea* Benth. Stems procumbent, 2.8 to 5.7 dm. long; leaves pinnately parted into 3 to 9 broad divisions; corolla 4 mm. broad.—Shady places in the foothills, San Francisco Bay to S. Cal.

2. *E. chrysanthemifolia* Benth. Stem erect, freely branching, 2.8 to 5.7 dm. high.—Shady ground, San Francisco Bay to S. Cal.

3. PHACELIA Juss.

Leaves alternate or basal. Flowers blue or white in coiled spikes or racemes. Calyx of nearly distinct sepals. Corolla from rotate to tubular, with internal appendages at base. (Greek phakelos, a cluster, many species with crowded flowers.)

Annuals.

Ovules usually more than 2 to each placenta; style bifid or cleft near the apex.....1. *P. divaricata*.

Ovules always 2 to each placenta.

Stamens not or scarcely exerted.

Capsule ovate, mucronate; corolla blue.....2. *P. ciliata*.

Capsule globose; corolla sordid white.....3. *P. distans*.

Stamens exerted.

Leaves divided; racemes 7.5 to 10 cm. long, ascending and approximate.....4. *P. tanacetifolia*.

Leaves simple; spikes solitary or geminate.....5. *P. malvacifolia*.

Perennial or biennial; petioles long; spikes short-peduncled.....6. *P. californica*.

1. *P. divaricata* (Benth.) Gray. Stems diffusely branched, 7.2 to 24 cm. long; leaves ovate to oblong, entire or rarely with a pair of supplementary lobes at base; corolla blue, open-campanulate, 1.2 to 1.8 cm. broad.—Open hillsides about San Francisco Bay.

2. *P. ciliata* Benth. Branched from the base; herbage scabrous; fruiting sepals chartaceous, oblong to broadly ovate, twice as long as the pod; seeds with honeycomb-like pits.—Valleys.

3. *P. distans* Benth. VERVENIA. Erect or diffuse, 1.4 to 3.3 dm. high; herbage hispid and pubescent; leaves finely dissected; corolla rotate-campanulate, 6 to 8 mm. long; appendages with free pointed apex.—Hillsides.

4. *P. tanacetifolia* Benth. FIDDLE-NECK. Similar to the last, but less

commonly branching and leaves less dissected; corolla bluish or lavender; appendages wholly adnate.—Plains and valleys.

5. *P. malvaefolia* Cham. STINGING PHACELIA. Stems 4 dm. high, hispid-bristly throughout, the bristles with a conspicuous swollen base; leaves broadly ovate, truncate or cordate at base, slightly lobed and toothed; corolla white.—San Francisco Bay to S. Cal.

6. *P. californica* Cham. ROCK PHACELIA. Stems erect, stout, 2.8 to 5.7 dm. high, from a depressed leafy caudex; herbage hairy or hispid; leaves with a large terminal lobe and 1 to several pairs of much reduced lobes or leaflets below; spikes dense, usually in a cluster at the end of the stem; corolla purple or white, 16 mm. long; stamens exerted.—Rocky points and ledges.

4. EMMENANTHE Benth.

Leaves mostly alternate. Flowers bell-shaped, yellow or cream color, persistent. (Greek emmeno, to abide, and anthos, flower, the corolla not deciduous.)

1. *E. penduliflora* Benth. WHISPERING BELLS. Bushy plants 2 to 2.8 dm. high; herbage somewhat sticky and soft hairy; leaves pinnatifid; flowers pendulous, 1.2 cm. long.—Montane, open slopes or in chaparral.

5. ERIODICTYON Benth.

Low shrubs with alternate leathery dentate leaves. Flowers in a terminal panicle, the branches coiled in the bud. Corolla funnelform, blue or white, without internal scales. Pod nearly or quite 2-celled by the meeting of the 2 placentæ, 4-valved, the valves shortly beaked. (Greek erion, wool, and diktuon, a net, by reason of the netted woolly under-surface of the leaves.)

1. *E. californicum* (H. & A.) Greene. YERBA SANTA. Commonly 8 to 12 dm. high; leaves very glutinous, oblong to oblanceolate, dentate except below, glabrous on the upper surface, the areas between the veins on the under surface with a close dense felt.—Dry mountain slopes and ridges, abundant and widely distributed.

2. *E. tomentosum* Benth. Whole plant, even to the flowers, densely white woolly or in age rusty.—Mesas and hills, S. Cal.

BORAGINACEAE. BORAGE FAMILY

Herbs. Leaves simple, commonly entire, mostly alternate. Flowers regular, the parts in 5s, except the superior ovary which is 4-lobed, borne chiefly in 1-sided coiled spikes or racemes. Style 1. Fruit splitting into 4 one-seeded nutlets.—Species 1500, temperate and tropical zones.

Nutlets erect; annuals.

Flowers white.

Lowest leaves opposite.....1. ALLOCARYA.

Leaves mostly in a basal tuft.....2. PLAGIOBOTHRYA.

Flowers yellow.....3. AMSINCKIA.

Nutlets broad, depressed, covered all over with short barbed prickles; flowers blue; perennials.....4. CYNOGLOSSUM.

1. ALLOCARYA Greene

Ours annuals with linear or narrow leaves, the lowest always opposite. Calyx persistent. Corolla white, with yellow throat, salverform with

short tube, the processes in the throat none or reduced. Nutlets ovate or ovate-lanceolate, smooth or variously roughened. (Greek *allos*, diverse, and *karua*, nut, the plants separated from *Cryptanthe* on account of the different fruits.)

1. **A. californica** (F. & M.) Greene. Branching herb, 2.3 to 3 dm. high; flowers 2 to 6 mm. broad; nutlet keeled ventrally and a little past the apex dorsally.—Common in low ground.

2. **PLAGIOBOTHRYS** F. & M.

Stems usually several from the base. Leaves mostly in a basal tuft. Herbage soft-pubescent and often rusty. Corolla white, mostly with crests in the throat. Nutlets ovate, keeled on both sides toward the apex and often also laterally margined, attached above their base or by their middle to the receptacle. (Greek *plagios*, on the side, and *bothrus*, pit or excavation, the first known species having a hollow scar.)

1. **P. nothofulvus** Gray. SNOW-FLOWER. Erect or nearly so, 3 to 7.6 dm. high; leaves oblong-ovate to lanceolate; calyx in fruit circumscissile below the middle, the upper part falling away and leaving the persistent base about the nutlets; corolla 4 to 6 mm. broad.—Hills and mountains.

2. **P. canescens** Benth. Branches several from the base, long and straggling, 1.5 to 4.6 dm. long, loosely flower-bearing nearly throughout; leaves oblong to linear or lanceolate; calyx persistent, its lobes connivent over nutlets in age and depressed.—Low open hills.

3. **AMSINCKIA** Lehm.

Herbage rough-hairy, the hairs with an enlarged base which is often conspicuously hardened or granular. Flowers yellow. Corolla somewhat salverform, the throat with folds but destitute of crests. Nutlets ovate-triangular, the surface shell-like, either smooth or rough. (Wm. Amsinck of Hamburg, patron of the Botanic Garden of that city.)

Corolla 12 to 14 mm. long.....1. *A. intermedia*.
Corolla 8 to 10 mm. long.....2. *A. spectabilis*.

1. **A. intermedia** F. & M. BUCKTHORN-WEED. Stems erect, often widely branching, to 9 dm. high; leaves oblong-lanceolate to linear; corolla 8 to 10 mm. long, its limb about 6 mm. in diameter; nutlets incurved, 2.5 mm. long.—Common in grain fields.

2. **A. spectabilis** F. & M. Corolla 12 to 14 mm. long, its limb about 8 mm. in diameter; nutlet somewhat compressed laterally.—S. Cal. and n.

4. **CYNOGLOSSUM** L.

Coarse perennial herb with broad leaves. Flowers blue, in a terminal loose cluster. Corolla with a ring of conspicuous appendages or crests at the throat. Nutlets bur-like. (Greek *kuon*, a dog, and *glossa*, tongue, on account of the shape and texture of the leaves in some species.)

1. **C. grande** Dougl. WESTERN HOUND'S TONGUE. Erect, 3 to 9 dm. high; leaves mostly basal, 7 to 18 cm. long, on long petioles; corolla 1.2 to 1.4 cm. long, the stamens inserted in the throat.—Coast Range woods, Monterey and n.

LABIATAE. MINT FAMILY

Aromatic herbs or low shrubs with square stems and opposite leaves. Calyx synsepalous, usually 5-toothed. Corolla 2-lipped, usually with 2 lobes in the upper lip and 3 in the lower. Stamens 4, in two pairs, or the upper pair wanting. Ovary superior, 4-lobed, splitting when ripe into 4 seed-like nutlets.—About 2,800 species distributed over the whole earth. Nearly all species have an aromatic odor due to the secretion of a volatile oil which has the characteristic taste of peppermint.

A. *Flowers solitary in the axils: stamens 4*

- Calyx with entire lips, a crest on the upper side.....2. SCUTELLARIA.
 Calyx not crested on upper side.
 Trailing herb; flowers small.....8. MICROMERIA.
 Shrub; flowers large.....9. SPHACELE.

B. *Flowers in clusters, often crowded in the axils of the opposite leaves and having the appearance of a whorl*

- Stamens conspicuously long-exserted and curved.....1. TRICHOSTEMA.
 Stamens moderately exserted or included.
 Corolla little irregular.
 Flowers in axillary whorls.....11. MENTHA.
 Flowers in terminal bracted heads; segments of the corolla narrow and very similar.....10. MONARDELLA.
 Corolla plainly 2-lipped.
 Calyx regular; flowers in whorls.
 Calyx-teeth 10, slender, hooked at tip; stamens included in corolla-tube.....3. MARRUBIUM.
 Calyx-teeth 5, triangular, cuspidate; stamens projecting beyond corolla-tube which has a hairy rim within.....5. STACHYS.
 Calyx 2-lipped or its teeth unequal.
 Stamens 4 (or 2).
 Flowers in a dense terminal spike with roundish bracts; upper calyx-lip truncate with 3 cusps on the margins.....4. BRUNELLA.
 Flowers in whorls, the whorls in a spike; upper calyx-lip 3-toothed.....7. POGONYNE.
 Stamens 2, the upper pair of stamens none or rudimentary; flowers in whorls or a panicle.....6. SALVIA.

1. TRICHOSTEMA L. BLUE CURLS

Leaves entire. Flowers blue in axillary cymes or becoming raceme-like in age. Calyx almost equally 5-cleft. Corolla with oblique limb, the oblong lobes nearly alike, the tube long, slender, abruptly curved into an arc of a circle just below the limb. Filaments hair-like, curved outward and downward and very much exserted. (Greek trichos, hair, and stemon, stamen.)

- Shrubby; leaves revolute; herbage sweet, aromatic.....1. *T. lanatum*.
 Annuals, 2.8 dm. high or less; leaves plane; herbage ill-scented.
 Stems very leafy; flower clusters nearly sessile.....2. *T. lanceolatum*.
 Stems sparsely leafy; flower clusters peduncled.....3. *T. laxum*.

1. *T. lanatum* Benth. ROMERO. About 8.5 to 11.5 dm. high; leaves numerous, narrowly linear, green and glabrous above, white-woolly beneath; flowers numerous in a virgate spike which is densely purple-woolly even to the calyx and (2.4 cm. long) corolla.—S. Cal. The herbage is used by Spanish-Californians as a remedy for ulcers and inflammations of the skin.

2. **T. lanceolatum** Benth. VINEGAR WEED. Stem simple or branching from the base; leaves lanceolate, sessile or nearly so; flower-clusters short-peduncled or nearly sessile.—Dry plains and hills. It is abundant over the interior foothills and is, in summer, an important bee plant.

3. **T. laxum** Gray. BLUE CURLS. Leaves lanceolate or oblong-lanceolate, petioled; flower-clusters rather loose.—Stream beds or low fields.

2. SCUTELLARIA L. SKULL-CAP

Perennial herbs. Flowers solitary in the axils of the opposite leaves or the upper leaves reduced and the inflorescence spike-like. Calyx 2 lipped, both lips entire, the upper with a scale-like or crest-like projection on the back. Corolla strongly 2-lipped with narrow upper lip, its tube long-exserted. (Latin scutella, a dish, on account of the conspicuous protuberance on the fruiting calyx.)

1. **S. tuberosa** Benth. BLUE SKULL-CAP. Stems 7.2 to 12 cm. high, from tuber-bearing rootstocks; leaves ovate or oval, petioled; corolla blue, 14 to 18 mm. long.—Shady woods or sandy valleys.

2. **S. californica** Gray. Stems clustered, commonly simple, 2 to 3.6 dm. high, the rootstocks not tuberous; leaves oval to lanceolate, crenate or entire, those subtending the flowers much reduced; corolla whitish or yellowish, 1.6 to 2.4 cm. long, the throat inflated.—Borders of thickets or woods.

3. MARRUBIUM L.

Perennial white-woolly herbs with wrinkled leaves and white flowers in whorls. Calyx cylindrical, 10-ribbed and 10-toothed, the spine-like teeth recurved at tip. Corolla-tube included in calyx, the upper lip erect and 2-cleft, the lower spreading and 3-cleft. (From the Hebrew, meaning bitter.)

1. **M. vulgare** L. COMMON HOREHOUND. Stems tufted, 2 to 5.7 dm. high; leaves roundish, crenate, petioled.—Nat. from Eur., denizen of waste places. An infusion of the herbage is used as a domestic remedy for colds and coughs.

4. BRUNELLA L.

Perennial herbs, the nearly simple stems terminated by a few whorls of flowers in a short spike; each whorl composed of 6 sub-sessile flowers and subtended by broad floral bracts. Calyx thin, veiny, 2-lipped; upper lip truncate with 3 minute hard teeth; lower lip 2-cleft; lips closed in fruit. Upper lip of corolla erect, elongated, entire, the lower 3-lobed with the middle lobe hanging downward. Stamens with each filament (or those of the upper stamens) with a small tooth below the anther. (Old German breune or braune, an affection of the throat, which self-heal was used to cure.)

1. **B. vulgaris** L. SELF-HEAL. Green and nearly glabrous, 9.6 to 24 cm. high; leaves oblong to ovate-lanceolate, obscurely serrate, petioled; corolla blue, pinkish or rarely white, exceeding the purplish calyx.—Woods near the coast and at middle altitudes in the mountains.

5. STACHYS L. HEDGE NETTLE

Hispid or soft-hairy herbs with the flowers few in the axils of the upper reduced leaves, thus forming an interrupted spike-like inflores-

cence. Calyx tubular-bellshaped or topshaped, 5 to 10-nerved and 5-toothed. Corolla-tube cylindrical; upper lip mostly erect and somewhat concave, entire or notched; lower lip longer, spreading, 3-lobed, the middle lobe larger and the lateral deflexed. (Greek stachus, an ear of corn, hence a spike; these plants have a spicate inflorescence.)

Flowers purplish; stems retrorsely hispid or hirsute.....1. *S. bullata*.
Flowers whitish.

Whorls distinct or indistinct; inflorescence 7 to 21 cm. long; herbage white-woolly.....2. *S. albens*.

Whorls distinct; inflorescence 4.8 to 9.6 cm. long; herbage villous or silky-hirsute.....3. *S. ajugoides*.

1. ***S. bullata*** Benth. SCARE-WEED. Stems simple or rarely branched above, 2 to 5.7 dm. high; herbage hispid, the stems retrorsely hispid, especially on the angles; leaves oblong-ovate, crenate; flowers about 6 in the axils of the opposite pair of leaves; flowers pinkish or purplish, 8 to 10 mm. long.—Common on low hills or in valleys. Sometimes it is a pest in low or bottom lands; in a series of excessively wet years it sometimes invades rich valley lands in an alarming manner, but a recurrence of normal rainfall causes it to disappear.

2. ***S. albens*** Gray. Stems erect, 5.7 to 14 dm. high; leaves ovate to lanceolate; whorls mostly indistinct and spicate, many-flowered.—Along rivulets or near springs in the dry inner country.

3. ***S. ajugoides*** Benth. Stems mostly erect, simple, 2 to 5.7 dm. tall; leaves oblong; one or two flower clusters below in the axils of upper ordinary leaves, the leaves above becoming bract-like and the clusters less remote.—Low lands.

6. SALVIA L. SAGE

Herbs or low shrubs, the flowers usually in whorls and the whorls in terminal racemes or spikes. Calyx 2-lipped, the upper lip entire or 3-toothed, the lower 2-cleft. Upper lip of corolla erect (sometimes almost none), the lower lip spreading, 3-lobed, the middle lobe often notched, cleft or fringed. Stamens inserted in the throat of the corolla, the upper pair sterile or rudimentary, the lower pair fertile with the anther-cells separated on a long filament-like connective which is jointed by the middle or near one end to the filament; upper end of connective with a perfect anther-cell, lower end with a rudiment or none. (Latin *salvéo*, to save, some of the species being officinal.)

Lower end of connective bearing a deformed anther-cell or rudiment; flower-whorls few; annuals.

Herbage white-woolly; bracts much surpassing the flowers.....1. *S. carduacea*.

Herbage dark green; bracts not exceeding the flowers.....2. *S. columbariae*.

Lower end of connective reduced to a subulate joint (the filament apparently simple); flower-whorls several; perennials.

Coarse herb with simple stems; corolla crimson.....3. *S. spathacea*.

Shrubs, freely branching; corolla white, whitish or bluish.

Leaves green; style and stamens little exerted.....4. *S. mellifera*.

Leaves white; style and stamens long exerted.....5. *S. apiana*.

1. ***S. carduacea*** Benth. THISTLE-SAGE. Stems 1 or several from a rosette of basal leaves, naked, bearing 1 to 4 whorls of flowers; leaves pinnatifid with spiny teeth; bracts ovate or lanceolate, spiny, surpassing the flowers; corolla light blue, 2.4 cm. long; upper lip 2-cleft; lower lip

with small lateral lobes and an exceedingly large fan-shaped middle lobe which is deeply fringed.—Sandy valleys.

2. **S. columbariae** Benth. CHIA. Stems 1 or several, mostly simple, bearing 1 or 2 pairs of leaves and 1 or 2 whorls of flowers; bracts roundish, acuminate and cuspidate; corolla blue, little exceeding the calyx, its upper lip notched, its lower lip with small lateral lobes and a large, somewhat 2-lobed middle one.—Mountain slopes. The seeds were gathered by the native tribes, forming part of their pinole or meal.

3. **S. spathacea** Greene. CRIMSON SAGE. Glandular, pubescent, 4 to 5 dm. high; upper surface of leaves dark green, under surface with short white tufts of wool; leaves ample, broadly oblong-ovate, crenate; flower-whorls 5 or 6, subtended by broad purplish bracts; calyx veiny, flattened sidewise but somewhat inflated. 2.4 cm. long or more; corolla 3 to 3.6 cm. long, the upper lip short, nearly erect, notched, the lower lip spreading with the lateral lobes short and the middle lobe large, inversely heart-shaped and very broad; stamens much exerted.—Open woods of the Coast Ranges.

4. **S. mellifera** Greene. BLACK SAGE. Shrub 8.6 to 17 dm. high, the herbaceous flowering branches very leafy at the base; leaves narrow oblong; corolla-tube longer than limb; upper lip notched, middle lobe of lower tip transversely oblong or roundish, joined to the main part of lip by a narrow constriction.—Hill country, S. Cal. and n. to Mt. Diablo. It is a very important bee shrub, especially southward.

5. **S. apiana** Jepson. WHITE SAGE. Shrub 8.6 to 23 or 28 dm. high, with long wand-like branches; leaves oblong-lanceolate; flowers in an open panicle inflorescence; bracts and bractlets lanceolate, at length reflexed; lower lip of corolla 1.2 cm. long, twice the length of the upper; corolla-tube 6 mm. long.—Dry hills, S. Cal., where it is one of the most important native bee shrubs.

7. POGOGYNE Benth.

Low sweet-aromatic annuals with the flowers in whorls and the whorls crowded into dense spikes or the lower whorls distinct. Calyx unequally and deeply 5-cleft. Corolla straight, tubular-funnel-form, blue or purplish, the upper lip erect and entire, the lower spreading with 3 similar oval lobes. Stamens 4 with anthers, or the upper shorter pair sterile. Style somewhat exerted, bearded above. (Greek pogon, beard, and gune, female, on account of the hairy style.)

1. **P. douglasii** Benth. Simple or commonly branching, 9.6 to 14.4 cm. high or more; leaves oblanceolate or obovate; stamens 4.—Abundant in low valley fields.

8. MICROMERIA Benth.

Trailing perennial herb. Flowers small, white, solitary and pediceled in the axils. Calyx tubular, almost equally 5-toothed. Corolla evidently 2-lipped. Stamens 4, included. (Greek mikros, small, and meros, part, on account of the small size of the flowers.)

1. **M. chamissonis** Greene. YERBA BUENA. Stems slender, 2.8 dm. long or more; leaves round-ovate, crenate, petioled; corolla pubescent externally, 8 mm. long.—Woods near the coast. The herbage is valued medicinally by Spanish-Californians, being used as a soporific.

9. **SPHACELE** Benth.

Shrubby plant with the large white or pink-tinted flowers solitary in the axils of the reduced upper leaves. Calyx bell-shaped, equally 5-lobed, veiny, inflated and membranous after flowering. Corolla with 4 short spreading lobes, the fifth and lowest lobe much longer and erect, its tube broad with a hairy ring at base within. (Sphakos, the name of the Greeks for sage, the plants of this genus having similar foliage.)

1. **S. calycina** Benth. PITCHER SAGE. Plants about 8.6 or 11.5 dm. high, the herbage pubescent or woolly; leaves ovate, toothed, 4.8 to 9.6 cm. long, the lowest petioled, the uppermost sessile.—Hillsides and cañons.

10. **MONARDELLA** Benth.

Rather pleasantly fragrant herbs with the flowers in heads. Heads terminal on the stems or branches, subtended by broad bracts which are often more or less colored. Calyx tubular, 15-nerved, with 5 equal or nearly equal teeth. Corolla rose-purple, lavender or dull white, the upper lip 2-cleft, the lower 3-parted, all the lobes linear or narrowly oblong. (Diminutive of *Monarda*, on account of its resemblance to that genus.)

1. **M. villosa** Benth. Perennial; stems mostly simple, several or many from a toughish or woody base; leaves round-ovate to lanceolate, entire or more commonly serrate, 1.2 to 2.4 cm. long, petioled.—Rocky hills.

11. **MENTHA** L. MINT

Odorous perennial herbs with slender creeping rootstocks and small flowers in whorls. Calyx bell-shaped or short-tubular, commonly 5-toothed. Corolla with a short tube, the upper lip notched, scarcely or not at all larger than the 3-lobed lower one. (Ancient Greek name.) Flower-whorls in the axils of foliage leaves, distinct.

Herbage commonly light green; branches leafy to the end....1. *M. canadensis*.

Herbage somewhat grayish; leaves toward the end of the branches reduced and inconspicuous.....2. *M. pulegium*.

Flower-whorls in terminal spikes (or some in the axils of the upper foliage leaves).

Leaves petioled; spikes thick, dense or little interrupted.....3. *M. piperita*.

Leaves sessile or nearly so; spikes slim, mostly interrupted.....4. *M. spicata*.

1. **M. canadensis** L. TULE MINT. Stems simple or much branched, 4 to 11 dm. long; leaves oblong-lanceolate, serrate, petioled; calyx-teeth similar and equal or nearly so.—Marshes.

2. **M. pulegium** L. PENNYROYAL. Stems 3 to 6 dm. high; leaves elliptic- to oblong-ovate, serrate or entire, petioled; calyx-teeth dissimilar, the two lower lanceolate-subulate.—Wet ground; nat. from Eur. and sometimes grown in kitchen gardens, the herbage used for seasoning.

3. **M. piperita** L. PEPPERMINT. Stems erect, unbranched below the terminal inflorescence; herbage glabrous; leaves ovate to oblong-lanceolate, sparsely and sharply serrate.—Along streamlets; nat. from Eur.

4. **M. spicata** L. SPEARMINT. Similar to no. 3; calyx campanulate, its teeth nearly as long as tube.—Wet places; nat. from Eur.

SOLANACEÆ. NIGHTSHADE FAMILY

Herbs (rarely shrubs) with alternate leaves, regular 5-lobed corolla, 5 stamens, a single style, and a 2-celled superior ovary which ripens into a

many-seeded capsule or berry.—Species about 1600, tropical and warm-temperate regions. The family is remarkable for its large number of both poisonous plants and edible plants. *Atropa belladonna* L. furnishes atropine, *Solanum nigrum* L. (Black Nightshade) yields solanine, *Datura stramonium* L. (Jamestown Weed) yields stramonium, and *Nicotiana tabacum* L. (Tobacco) furnishes nicotine;—all effective alkaloidal poisons. *Hyoscyamus niger* L. (Henbane) and *Physalis alkekengii* L. (Winter Cherry) yield narcotics; while *Solanum tuberosum* L. (Potato) and *Lycopersicum esculentum* Mill. (Tomato) are edible. The leaves of all species are probably narcotic and exciting.

Corolla rotate; fruit a berry; flowers in umbels or cymes.

Anthers distinct, shorter than the filaments.....1. CAPSICUM.

Anthers more or less coherent, longer than the filaments.

Anthers lightly joined around the style and opening by a terminal hole....

2. SOLANUM.

Anthers united at tip and opening lengthwise.....3. LYCOPERSICUM.

Corolla funnelform or tubular; fruit a dry pod.

Flowers solitary, very large; pod prickly.....4. DATURA.

Flowers in a terminal panicle; pod smooth.....5. NICOTIANA.

1. CAPSICUM L.

Annual herbs. Leaves ovate, entire. Flowers white. Calyx truncate. Berry often dryish, inflated and 1-celled. (Etymology unknown.)

1. **C. annum** L. CHILE PEPPER. Berry red or green, large, oblong or globular, often angled, dry.—Cult. from the American tropics. The berry is amazingly pungent and is used as a condiment by Mexicans and others. When dried and ground it forms Cayenne Pepper. Prescott, the historian, said, in Spain, that politeness made him taste, but no power on earth could compel him to eat foods cooked with cayenne, for they were hotter than the Inquisition.

2. SOLANUM L. NIGHTSHADE

Ours herbs with flowers in umbels on short lateral or terminal peduncles. Corolla rotate. Anthers almost sessile, lightly joined around the style and opening by a pore at apex. Fruit a berry. (Latin name of the nightshade, from solamen, quieting.)

Plants not at all prickly; anthers obtuse.

Plants without rootstocks, not bearing tubers.

Peduncles much shorter than the pedicels or almost none.....

1. *S. umbelliferum*.

Peduncles longer than the pedicels.

Annual; flowers 4 to 5 mm. broad.....2. *S. nigrum*.

Perennial; flowers 6 to 11 mm. broad.....3. *S. douglasii*.

Plants with rootstock, the rootstock developing tubers.....4. *S. tuberosum*.

Plants more or less prickly; anthers acute.....5. *S. melongca*.

1. **S. umbelliferum** Esch. BLUE WITCH. Stems mostly 5.7 to 8.6 dm. high, often woody at base; herbage finely pubescent with branched hairs; leaves elliptic-ovate; peduncles shorter than the pedicels or almost none; corolla blue, 1.8 cm. broad, with 5 pairs of greenish glands near the base; berry dull white, 8 to 18 mm. in diameter.—Gulches and cañons. *S. XANTI* Gray. Similar, herbaceous; pubescence viscid with simple hairs.—S. Cal.

2. **S. nigrum** L. BLACK NIGHTSHADE. Low diffuse annual; herbage glabrous but the stems scabrous on the angles; leaves elliptic-ovate,

petioled; peduncles longer than the pedicels; corolla whitish, aging purplish, 6 mm. broad or less; berries blue-black, nearly as large as peas, borne on more or less recurved pedicels.—Waste ground, in moist or shady places.

3. **S. douglasii** Dunal. Similar to no. 2 but perennial; herbage lightly puberulent; leaves triangular-ovate; corollas larger.—Monterey to S. Cal.

4. **S. tuberosum** L. POTATO. Erect; leaves pinnate, of several ovate leaflets with minute ones intermixed; flowers blue or white; berries green.—Cult. from S. Am. for the tubers.

5. **S. melongea** L. EGG-PLANT. Leaves ovate, obscurely sinuate, rather downy; corolla violet with yellow eye; fruit very large, oblong or ovate, violet-color or whitish.—Cult. from India.

3. LYCOPERSICUM Mill.

Herbs with rank-scented foliage, pinnately compound leaves, and yellow flowers. Corolla rotate, with very short tube. Anthers converging around the style, united by a membrane at their tips and opening lengthwise. Fruit a several-celled and many-seeded large berry. (Greek lucos, wolf, and persicum, peach, perhaps because the primitive fruit is a dangerous poison.)

1. **L. esculentum** Mill. TOMATO. Hairy herb; leaves interruptedly pinnate, the larger leaflets cut or pinnatifid, ovate or ovate-oblong and pointed; flower clusters short and forked; berry red or yellow, varying much in cultivation.—Cult. from trop. Am.

4. DATURA L. THORN-APPLE

Coarse rank-smelling herbs with ovate leaves and large showy flowers in the forks of the branching stem. Calyx circumscissile near the base, the lower part persisting as a rim or collar beneath the fruit. Corolla funnelform with ample plaited border. Fruit a globose prickly capsule. (The Hindoo name, dhatura.)

1. **D. meteloides** DC. TOLGUACHA. Branching plant 5.7 to 8.6 dm. high; corolla white, 1.4 to 1.9 dm. long, the border with 5 awl-shaped teeth 1.2 to 1.8 cm. long; persistent base of calyx rotate; pods nodding, the spines short.—Valleys.

2. **D. stramonium** L. STRAMONIUM. Stems greenish; corolla white, 4.8 to 9.6 cm. long; pods erect, with few spines, the lower much shorter than the stout upper ones which are often 1.8 cm. long.—Naturalized weed, native of eastern U. S.

5. NICOTIANA L. TOBACCO

Heavy-scented herbs with entire leaves and flowers in clusters. Calyx persistent about the 2-celled smooth capsule. Corolla salverform or funnelform. (Jean Nicot, 1530-1600, French diplomat and author of the most ancient dictionary of the French language, but more celebrated as having introduced tobacco into France from Portugal.)

Annuals; herbage viscid.

Flowers red; cauline leaves sessile.....1. *N. tabacum*.

Flowers white, native species.

Leaves sessile or sometimes tapering into a petiole; corolla limb 1.8 to 2.4 cm. broad.....2. *N. bigelovii*.

Leaves all petioled; corolla limb 6 to 10 mm. broad.....3. *N. attenuata*.

Shrubs; flowers yellow; herbage glabrous and glaucous.....4. *N. glauca*.

1. *N. tabacum* L. COMMON TOBACCO. Leaves half-clasping, ovate, oblong, elliptic or lanceolate; calyx-teeth unequal; corolla red, its tube white; throat more or less inflated.—Cult.; native of America. The use of tobacco was introduced into England by Sir Walter Raleigh. Sir Walter started such a smoke as will in all probability never be extinguished in Christendom. The price of smoking tobacco aside, our people pay indirectly (through conflagrations traceable to smoking) a larger sum by far for this kind of luxury than any other. Tobacco has also been made famous by "little Johnny Reed," though not in the way that was intended.

2. *N. bigelovii* Wats. Fig. 5. Stem simple at base and branched above, 4 to 8 dm. high; leaves oblong-ovate, sessile (except the basal ones); calyx-teeth as long as tube; filaments unequally inserted high in the tube, glabrous.—Plains and valleys.

3. *N. attenuata* Torr. INDIAN TOBACCO. Habit of no. 2; leaves petioled; calyx-teeth commonly $\frac{1}{4}$ to $\frac{1}{3}$ as long as tube; filaments equally inserted low down in corolla-tube, pubescent below the middle.—Plains and valleys.

4. *N. glauca* G r a h a m. TREE TOBACCO. Soft-woody evergreen shrub, 1.7 to 4.3 m. high; leaves ovate; throat of corolla constricted just below the short limb.—Naturalized about interior towns, native of S. Am.



Fig. 5. *Nicotiana bigelovii* Wats.: a, fl. branchlet $\times \frac{1}{2}$; b, leaf $\times \frac{1}{2}$; c, long. sect. of corolla $\times 1$.

SCROPHULARIACEAE. FIGWORT FAMILY

Herbs or low shrubs with perfect flowers. Corolla 2-lipped or only slightly irregular. Stamens 4 and unequal, less commonly 5 or 2, the fifth stamens often represented by a sterile filament or gland. Ovary superior, 2-celled; style 1; stigma commonly 2-lobed, rarely entire. Fruit a many-seeded capsule.—About 2500 species, distributed over the whole earth.

A. *Leaves opposite (or the upper sometimes alternate).*

Fifth stamen present as a sterile filament, scale or gland.

Annuals; corolla strongly 2-lipped with the middle lobe of the lower lip sac-like and inclosing stamens and style; fifth stamen reduced to a mere papilla-like gland.....1. COLLINSIA.

Perennials.

Corolla-tube somewhat globular, the 2 upper and 2 lateral lobes erect, the lower one reflexed; sterile filament adnate to upper side of corolla.....2. SCROPHULARIA.

- Corolla from strongly 2-lipped to nearly regular; sterile filament conspicuous, often equaling the fertile ones.....3. PENTSTEMON.
 Fifth stamen wholly absent.
 Stamens 4; corolla tubular or funnelform, 2-lipped; calyx 5-angled.
 Shrubs.....4. DIPLACUS.
 Herbs.....5. MIMULUS.
 Stamens 2; corolla nearly rotate, 4-cleft; calyx 4-parted.....6. VERONICA.

B. *Leaves alternate.*

- Calyx tubular, 4-cleft, or cleft before and behind with the lobes entire or 2-cleft.
 Upper lip long and narrow, very much exceeding the small 3-toothed lower lip; bracts with colored tips.....7. CASTILLEIA.
 Upper lip similar to preceding, but little or not at all exceeding the conspicuously 3-saccate lower lip; bracts with or without colored tips.....8. ORTHOCARPUS.
 Calyx narrowly campanulate, 5-toothed; upper lip of corolla long, arched, the lower very short, of 3 small lobes.....9. PEDICULARIS.

1. **COLLINSIA** Nutt.

Low slender annuals with the flowers in whorls. Calyx 5-cleft. Corolla 2-lipped, its tube short, the abruptly expanded throat forming an angle with it; upper lip 2-cleft; lower lip larger, 3-lobed, the middle lobe sac-like or keel-shaped and inclosing the 4 declined stamens and styles. Gland at base of corolla on upper side representing fifth stamen. (Zaccheus Collins, American botanist of Philadelphia, 1764-1831.)

- Flowers solitary or in whorls of 2 or 3, some or all the pedicels much longer than the flowers.....1. *C. sparsiflora*.
 Flowers crowded in whorls, with short pedicels or almost sessile.
 Corolla rose-purple or violet, the upper lip paler; herbage not staining brown.. 2. *C. bicolor*.
 Corolla white to yellowish; herbage staining brownish.....3. *C. tinctoria*.

1. ***C. sparsiflora*** F. & M. About 1.4 dm. high, freely branching; herbage reddish; lowest leaves elliptical, 6 mm. long, on petioles nearly as long, the upper oblong to linear, becoming gradually sessile; corolla 8 to 12 mm. long, bluish or purplish, sometimes yellowish at base; upper pair of filaments hairy, as in all the following.—Low fields or wet hill-sides.—Var. **FRANCISCANA** Jepson. Stouter, 1.4 to 4.3 dm. high; leaves ovate-lanceolate, 3 to 5 in a whorl.—Sandy lands near coast.

2. ***C. bicolor*** Benth. **CHINESE HOUSES.** Simple or branching from the middle, 1 to 4 dm. high; leaves oblong, serrulate; calyx-lobes commonly lanceolate, acute; corolla rather less than 2.4 cm. long, rose-purple or violet, the upper lip conspicuous, more or less white; throat saccate, bristly within, oblique with the tube.—Edges of woods, common.

3. ***C. tinctoria*** Hartw. Stems stoutish, simple or diffusely branching, 2.5 to 5.5 dm. long; corolla declined a little below the horizontal, the throat at right angles with the tube; upper lip very short, with 2 transverse purple lines.—Wooded hillsides, Sierra foothills, rare in the Coast Ranges.

2. **SCROPHULARIA** L. FIGWORT

Tall herbs with small lurid red flowers in a terminal panicle. Calyx deeply 5-cleft. Corolla-tube somewhat globular, the 2 upper and 2 lateral lobes erect, the short lower one deflexed. Stamens 4, declined, a fifth sterile stamen adnate to the corolla-tube on upper side. (Latin *scrofulae*, the plant a one-time remedy for scrofula.)

1. *S. californica* Cham. Leaves ovate, heart-shaped at base, serrate.—Common in moist places along gulches or in the hills.

3. PENTSTEMON Ait.

Perennial herbs or sometimes with woody stems. Flowers showy, in racemes or panicles. Corolla tubular, 2-lipped or the segments almost alike. Stamens with anthers 4, the fifth stamen represented by a conspicuous sterile filament. (Greek pente, five, and stemon, stamen.)

Fertile filaments all bearded or pubescent at base, anthers glabrous; shrubs or bushes.

Corolla red, tubular, the lips shorter than the narrow tube.....1. *P. cordifolius*.

Corolla yellowish, gaping, the spreading lips longer than the short tube.....

2. *P. breviflorus*.

Fertile filaments mostly not bearded at base; herbage glabrous or nearly so.

Anthers dehiscing their whole length or nearly so.

Leaves entire, sessile or subcordate-clasping; corolla vermillion.....

3. *P. centranthifolius*.

Leaves acutely dentate, sessile or the lowest petioled, the upper connate-perfoliate; corolla red-purple.....

4. *P. spectabilis*.

Anthers dehiscing from the apex to the middle only; corolla blue or purple....

5. *P. heterophyllus*.

1. *P. cordifolius* Benth. Scrambling over bushes by its long woody runner-like branches; leaves ovate, often heart-shaped at base, finely toothed, prominently veined beneath; flowers in a somewhat leafy panicle; corolla 2.4 cm. long or more, the upper lip erect, lower more or less spreading; anther cells dehiscing their whole length; sterile filament bearded.—S. Cal.

2. *P. breviflorus* Lindl. Stems simple from a branched woody base, 8 to 17 dm. high; leaves lanceolate or oblong-lanceolate, denticulate, 1.8 to 6.6 cm. long; corolla white with purplish markings, deeply 2-lipped, the upper lip erect, the lower widely spreading; anther cells dehiscing their whole length; sterile filament glabrous.—Dry hills.

3. *P. centranthifolius* Benth. SCARLET BUGLER. Stems simple, clustered, 3 to 8.5 dm. high; leaves ovate to oblong-lanceolate with somewhat heart-shaped clasping base, 3.6 to 6 cm. long; corolla tubular with nearly equal lobes, scarlet, 2.4 cm. long; sterile filament naked.—Rocky cliffs, sandy dunes or mesas.

4. *P. spectabilis* Thurb. Stems slender, simple, 8.5 to 11.5 dm. high; leaves ovate to oblong; corolla 2-lipped, abruptly dilated above the narrow tube; sterile filament glabrous.—Dry hills and valleys, S. Cal.

5. *P. heterophyllus* Lindl. Stems many, erect or ascending, 2.8 to 4.3 dm. high; herbage minutely puberulent; leaves linear to lanceolate, 3.6 cm. long or less; corolla 2-lipped, abruptly dilated above the narrowly tubular base, blue or purple, 2.4 to 3 cm. long; upper lip short, more or less reflexed, the lower longer, spreading.—Coast Range hills.

4. DIPLACUS Nutt.

Evergreen glutinous shrubs with the leaves revolute in the bud. Flowers salmon-color or red, solitary in the axils. Calyx tubular, 5-angled, 5-toothed. Corolla with funnellform tube, strongly 2-lipped. Stamens 4. Stigmas 2, closing together when irritated. Valves of capsule spreading out nearly flat. (Greek di, double, and plakous, a cake, referring to the placentae.)

1. *D. glutinosus* Nutt. BUSH MONKEY-FLOWER. Leaves oblong-lanceolate; corolla salmon-color, 3.6 cm. long or more.—Cañon sides.

5. MIMULUS L. MONKEY-FLOWER

Herbs with showy yellow or red flowers, solitary and axillary, or in terminal racemes. Corolla tubular to funnellform, 2-lipped or the lobes only slightly irregular, a pair of bearded or naked ridges running down the lower side of the throat. Stamens 4. Stigmas as in *Diplacus*. Pod splitting open on one or both sides, or remaining closed. (Diminutive of the Latin *mimus*, a comic actor, on account of the gaping or grinning corolla.)

Flowers red or scarlet.

Dwarf annuals, as if stemless or nearly so, the leaves basal; corolla large for the size of plant.

Plant 2.4 to 4.8 cm. high; stems apparently none.

Upper lip of corolla exceeding the lower; throat funnellform.....

1. *M. angustatus*.

Lower lip of corolla almost none; throat campanulate or urn-shaped..

2. *M. subuniflorus*.

Stem often with branches 7.2 to 9.6 cm. long.....3. *M. tricolor*.

Robust perennials with leafy stems.

Pedicels very short.....4. *M. bolanderi*.

Pedicels 2.4 to 6.6 cm. long.....5. *M. cardinalis*.

Flowers yellow or white.

Herbage glabrous or merely pubescent.....6. *M. guttatus*.

Herbage slimy or viscid-pubescent.

Pubescence viscid; leaves lanceolate or linear.....7. *M. brevipes*.

Pubescence with soft long hairs.

Stems weak and reclining; leaves short-petioled.....8. *M. moschatus*.

Stems erect; leaves sessile; lower lip of corolla with brown-purple spots.....9. *M. exilis*.

1. *M. angustatus* Gray. Leaves linear, 2.4 cm. long or less; corolla crimson, dotted with purple and yellow, its limb broad (the upper lip exceeding the lower), its tube very slender or thread-like, 2.4 to 3.6 cm. long.—Borders of surface streams.

2. *M. subuniflorus* Greene. Leaves rhombic-ovate to oblong; corolla crimson, 3.6 cm. long, the tube slender, the throat narrowly bell-shaped; lower lip of corolla almost none, the upper lip conspicuous, erect.—Wet hillsides.

3. *M. tricolor* Hartw. Leaves lanceolate to oblanceolate-oblong; corolla red, 3.6 to 4.8 cm. long; lips little unequal; throat broadly funnellform, with crimson and yellow markings.—Edges of vernal pools, plains and valleys.

4. *M. bolanderi* Gray. TOBACCO MIMULUS. Simple or with many erect branches, 1 to 4 dm. high, very viscid; leaves lanceolate or oblong, sessile; upper teeth of calyx much the longest; corolla dark red, its lips nearly equal.—Coast Ranges, Sierra Nevada.

5. *M. cardinalis* Dougl. Branched from the base, 2.8 to 8.6 dm. high; leaves elliptic-ovate, 4.8 cm. long or more, toothed; flowers solitary in the axils, much shorter than the pedicels; corolla strongly 2-lipped, scarlet, 3 to 4.8 cm. long, the tube little exserted from calyx.—Stream banks or about springs.

6. *M. guttatus* DC. Fig. 6. Stems erect, simple or branching, 1.4 to 8.6 dm. high; leaves roundish or oblong, toothed, the lower petioled, the upper sessile; flowers in a terminal raceme; upper tooth of calyx commonly the longest; corolla yellow, with purple or brown dots in throat, 2-lipped, 1.2 to 4.8 cm. long.—Exceedingly common and variable.

7. *M. brevipes* Benth. Stems 2.8 to 5.5 dm. high, simple, viscid-pubescent; leaves lanceolate or linear, entire or sharply denticulate; corolla yellow, with very short included tube, campanulate-ventricose throat and ample rounded lobes, the limb 3.6 cm. across.—Hillsides, S. Cal.

8. *M. moschatus* Dougl. var. *sessilifolius* Gray. Stems rooting at the lower nodes, 2.8 to 5.7 dm. long; whole plant wet as if with slimy dew, musk-scented; leaves ovate, sparingly toothed, about 4.8 cm. long, sessile or shortly petioled; flowers solitary in the upper axils, on pedicels 2.4 to 4.8 cm. long; corolla yellow, 2.4 cm. long, its lobes not very unequal.—Margins of rivulets and streams.

9. *M. exilis* Dur. Stem 1.5 to 3 dm. high, much-branched from the base, villous throughout with long and soft white and somewhat viscid hairs; leaves lanceolate to oblong, entire, sessile; flowers axillary; corolla yellow, its lobes equal, the lower one with two brown-purple spots.—Gravelly banks and beds of flood streams.

6. VERONICA L. SPEEDWELL

Ours herbs with the flowers in axillary or terminal racemes or solitary. Calyx 4-parted. Corolla somewhat rotate, deeply 4-cleft, the upper lobe commonly broadest. Stamens 2, on the upper side, exserted. Stigma 1. Capsule flattened. (Name thought to be in memory of St. Veronica.)

1. *V. peregrina* L. NECKWEED. Erect annual, 1 to 2.8 dm. high; leaves oblong, 8 to 24 mm. long, the lowest opposite, the upper alternate and uppermost reduced; flowers white, solitary in the axils; pod inversely heart-shaped.—Low valley fields.

2. *V. americana* Schwein. BROOKCLIME. Perennial with stems 2.8 to 5.7 dm. long; leaves oblong-ovate, serrate, 3.6 to 7.2 cm. long, bearing peduncled racemes in their axils; flowers blue; pod roundish.—Springs and rivulets.

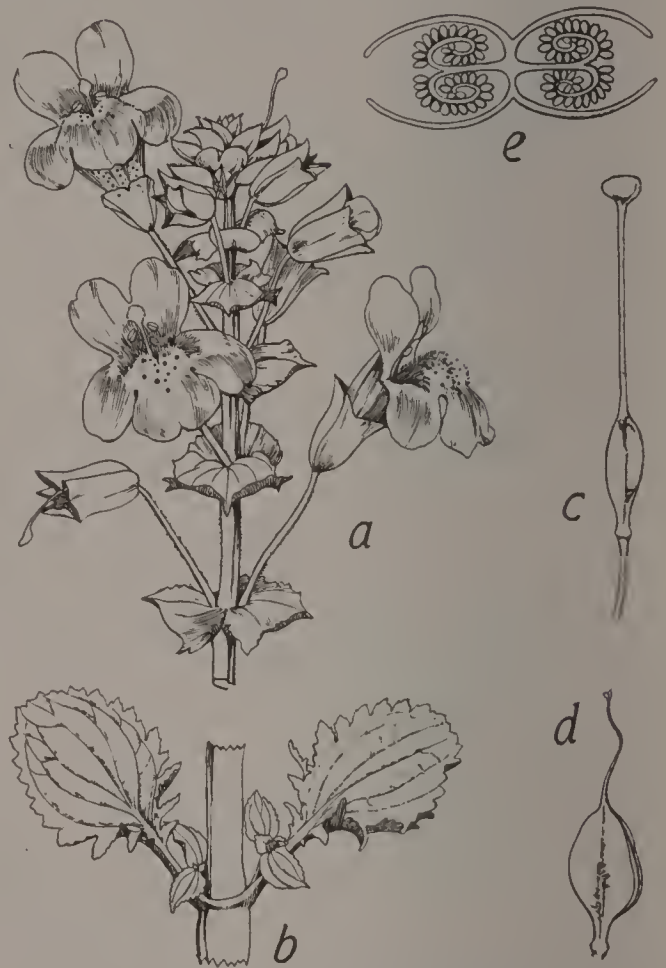


Fig. 6. *Mimulus guttatus* DC.; a, fl. branchlet x $\frac{1}{2}$; b, leaves x $\frac{1}{4}$; c, pistil x $1\frac{1}{2}$; d, capsule x 1; e, cross sect. of capsule x 4.

7. **CASTILLEIA** Mutis. PAINTED CUP

Root-parasitic herbs (or sometimes with woody stems), ours perennials. Leaves sessile, entire or more commonly toothed or cleft. Flowers in terminal spikes or racemes. Bracts and calyx red, scarlet or yellow in whole or in part, more showy than the dull yellow or greenish corolla. Calyx flattened, 2-cleft. Lower lip of corolla very short, 3-lobed or toothed, the upper very long, flattened and arched at tip and inclosing the 4 stamens and style. (D. Castillejo, Spanish botanist.)

Calyx much more deeply cleft before than behind: corolla sickle-shaped, the upper lip well exerted from lower side of calyx and exposing the lower lip.....

1. *C. affinis*.

Calyx equally cleft before and behind: upper lip included or little exerted from the calyx, the lower lip not exposed.

Calyx-lobes mostly 2-cleft to middle.....2. *C. parviflora*.

Calyx-lobes entire or notched at apex.

Herbage viscid-pubescent; leaves oval or obovate.....3. *C. latifolia*.

Herbage white-woolly; leaves linear.....4. *C. foliolosa*.

1. ***C. affinis*** H. & A. SCARLET CUP. Branches mostly simple and few from the base, 2.8 to 5.7 dm. high; leaves linear, entire, 9.6 cm. long or less; raceme loose below; bracts scarlet, 3-parted, the middle lobe 3-cleft; flowers 3 cm. long; calyx-lobes notched or 2-cleft at apex; corolla yellowish; upper lip about as long as tube.—Borders of woods.

2. ***C. parviflora*** Bong. var. ***douglasii*** Jepson. INDIAN PAINT BRUSH. Herbage hairy; leaves linear (varying to lanceolate or oblong), entire or sparingly cleft, 3.6 to 8.4 cm. long; bracts red, yellow or white above the middle, 3-parted, the middle often 3-cleft; corolla straight, upper lip about as long as tube.—Wooded cañons.

3. ***C. latifolia*** H. & A. SEASIDE PAINTED CUP. Stems 1 to 4 dm. high; herbage sticky pubescent; leaves thick, oval or obovate, the upper 3-lobed at apex; bracts very short and broad, with 3 oblong lobes; calyx-lobes almost equaling the small (1.8 cm. long) corolla.—Sea cliffs and headlands.

4. ***C. foliolosa*** H. & A. WOOLLY PAINTED CUP. Stems clustered, woody at base, 2.4 to 4.3 dm. high; herbage white woolly; leaves linear, entire, crowded below and fascicled in the upper axils, about 2.4 cm. long or less; uppermost leaves and bracts 3-parted; spikes dense; flower 1.8 cm. long; calyx-lobes truncate or merely notched.—Dry rocky or gravelly Coast Range slopes.

8. **ORTHOCARPUS** Nutt. OWL'S CLOVER

Ours annuals with the flowers in spikes, the bracts either colored or not colored. Calyx tubular, 4-cleft. Corolla tubular, the upper lip similar to that of *Castilleia*, but not so greatly or not at all exceeding the lower one; lower lip 3-saccate, inflated and often very conspicuous. (Greek *orthos*, upright, and *karpos*, fruit.)

Seeds with a close coat; anthers 1-celled.

Stamens in anthesis exerted from galea; flowers 4 to 6 mm. long.....

1. *O. pusillus*.

Stamens in anthesis not exerted from galea; flowers mostly more than 1.2 cm. long.

Herbage greenish; galea whitish.....2. *O. faucibarbatius*.

Herbage purplish; galea purple.....3. *O. erianthus*.

Seeds with a loose cellular coat; anthers 2-celled.

Bracts herbaceous, cleft into linear or lanceolate lobes....4. *O. lithospermoides*.

Bracts with purplish or whitish tips.

Filaments glabrous; galea nearly straight, pubescent.

Spikes virgate, lax below.....5. *O. attenuatus*.

Spikes stout, dense.

Leaves 2.4 to 6 cm. long; stems simple or little branched.....

6. *O. densiflorus*.

Leaves 1.2 to 3.6 cm. long; leaves freely branched.....

7. *O. castilleioides*.

Filaments hairy; galea hooked at apex.....8. *O. purpurascens*.

1. ***O. pusillus*** Benth. Slender, weak, 4.8 to 9.6 cm. high; herbage purplish; leaves pinnately cleft into linear or filiform divisions; bracts longer than the scattered inconspicuous dark red flowers; corolla 4 to 6 mm. long.—Low hills.

2. ***O. faucibarbatu***s Gray. Branched from the middle, 1.5 to 3 dm. high; herbage greenish; leaves oblong or strap-shaped at base, above pinnately cleft; spikes at length elongated and lax; bracts shorter than the flowers, palmately cleft; corolla yellow or white, 1.8 to 2.3 cm. long, its tube very slender, twice the length of the calyx; sacs of lower lip 4 mm. deep, deeper than high.—Low fields.

3. ***O. erianthus*** Benth. JOHNNY-TUCK. Stems branched or unbranched, 1.2 to 1.9 dm. high; leaves pinnately divided into filiform divisions; spikes slender; corolla about 1 cm. long, sulphur-yellow except the dark purple upper lip, its thread-like tube at least twice the length of the calyx; sacs of the lower lip 4 mm. deep, deeper than high, each sac commonly with 2 greenish yellow spots at base of the tooth; folds in the throat densely bearded.—Abundant on the plains and low hills or in valleys. Var. *VERSICOLOR* Jepson. Corolla white, excepting the purple upper lip. Var. *ROSEUS* Gray. Corolla rose-color.—The varieties near the coast.

4. ***O. lithospermoides*** Benth. CREAM SACS. Commonly simple, 1.4 to 2.8 dm. high; lower leaves lanceolate, entire, the upper oblong with a few slender lobes; spike very dense and thick; bracts nearly equaling the flowers, mostly broad at base, palmately cleft above; corolla 2.4 cm. long or more, rich cream-color, its tube dilated upward; lower lip strongly 3-saccate.—Plains and low hills.

5. ***O. attenuatus*** Gray. Commonly slender and strict, 1.2 to 2.8 dm. high; leaves linear-lanceolate, attenuate, entire or the upper with 1 or 2 filiform lobes, 2.4 to 7.2 cm. long, 2 to 10 mm. wide; spikes slender; calyx-lobes 4, thread-like, nearly equal; corolla dull white; lower lip shallowly saccate, purple-dotted, its lanceolate teeth large for the size of the corolla, almost as long as the saccate portion and nearly or quite equaling the upper lip.—Open fields and low hills.

6. ***O. densiflorus*** Benth. ESCOBITA. Simple or with strict branches, 1.2 to 3.6 dm. high; leaves oblong-lanceolate to linear with mainly a pair of filiform divisions; spike dense, cylindric, 2.4 to 9.6 cm. long; bracts with purple and white tips; calyx-segments spatulate, purple; corolla 1.8 to 2.2 cm. long, purple and white, the lower lip with large crimson dots, its teeth nearly as long as upper lip.—Valleys and low hills.

7. ***O. castilleioides*** Benth. JOHNNY-NIP. Corymbosely branched, 1.4 to 2.4 dm. high; leaves broader than in preceding, entire or with linear divisions; spikes short and dense or even almost head-like; bracts with

white or yellowish tips; calyx-segments linear; corolla 1.2 to 1.8 cm. long, dull white with purple marks, the upper lip plainly longer than the crimson teeth of the lower lip.—Marshy ground.

8. **O. purpurascens** Benth. OWL'S CLOVER. Simple or sometimes much branched, 9.4 to 36 cm. high; leaves parted into many filiform divisions which are often brownish-tinged; bracts palmately cleft into filiform or narrowly linear lobes, the upper with crimson spatulate tips; corolla crimson, 2.4 to 3 cm. long; lower lip white-tipped with yellow and purple markings.—Low hills and valleys.

9. **PEDICULARIS** L. LOUSEWORT

Perennial herbs. Flowers in a spike. Calyx 2 to 5-cleft. Corolla tubular, strongly 2-lipped. Upper lip flattened and strongly arched at apex; lower lip very much shorter than the upper, of 3 small rounded lobes. Stamens 4, under the upper lip. Capsule flattened. (Latin pediculus, a louse; of uncertain application.)

1. **P. densiflora** Benth. INDIAN WARRIOR. Stems simple and erect, 2 to 2.8 dm. high, commonly several from the scaly caudex; leaves pinnately parted or divided, the segments cleft or toothed; bracts linear, ciliate or serrate at apex; calyx 5-angled, equally or unequally 5-toothed, less than 8 to 10 mm. long; corolla crimson, 2.4 cm. long or more.—Hills and mountains.

OROBANCHACEAE. BROOM-RAPE FAMILY

Root-parasitic herbs, yellowish or brownish, without green color. Leaves reduced to scales. Corolla tubular, 2-lipped, the upper lip 2-lobed, the lower 3-lobed. Stamens 4, didynamous. Ovary superior, 1-celled; style one, long. Fruit a capsule.—Species about 90, all continents.

1. **OROBANCHE** L. BROOM-RAPE

Calyx 5-cleft. Placentae 4, 2 on each valve of the capsule. (Greek orobos, vetch, and anchone, choker.)

1. **O. fasciculata** Nutt. Scaly stem 2.4 to 4.8 cm. high, bearing many fascicled 1-flowered peduncles; corolla yellow, 2.4 to 3.6 cm. long.—Mountain slopes or ridges, parasitic on perennial herbs or small shrubs.

PLANTAGINACEAE. PLANTAIN FAMILY

Herbs with a basal cluster of ribbed leaves and naked stems bearing a terminal spike or head of regular flowers. Sepals 4 (or 2). Corolla 4-parted. Stamens 4, protruding. Ovary superior, 2 (or falsely 4)-celled. Style 1, slender with long hairy stigma. Fruit a capsule, opening by a lid.—About 200 species, distributed over the whole earth.

1. **PLANTAGO** L. PLANTAIN

Corolla small, salver-shaped or rotate, withering-persistent. (Latin name of the plantain.)

Perennials; stamens 4; leaves ovate or oblanceolate; naturalized species.

Ovules 2; bracts attenuate into a long point.....1. *P. lanceolata*.

Ovules 8 to 18; bracts ovate, not long-pointed.....2. *P. major*.

Annuals; leaves linear or oblanceolate; native species.

Stamens 4; capsule 2-seeded.....3. *P. erecta*.

Stamens 2; capsule commonly 4-seeded.....4. *P. bigelovii*.

1. *P. lanceolata* L. ENGLISH PLANTAIN. RIBWORT. Leaves lanceolate and strongly 3 to 5-ribbed, mostly hairy; stem longer than the leaves, 1.5 to 4 dm. high; spike short-cylindrical, 1.8 to 4.8 cm. long; sepals scarious.—Nat. from Eur.

2. *P. major* L. COMMON PLANTAIN. Leaves round-ovate, glabrous, marked with 5 to 7 prominent ribs, often toothed; stem proper not as long as the leaves, bearing an elongated spike 7.2 to 14.4 cm. long; sepals scarious with green center.—Low fields and waste places, nat. from Eur. It has followed quickly upon the white settler in his settlements everywhere westward across the continent and the Red Indian therefore calls it White Man's Foot.

3. *P. erecta* Morris. Silky pubescent, 9.6 to 12 cm. high; leaves narrowly linear to oblanceolate, commonly shorter than the stems; spikes dense, oblong or even head-like; sepals scarious, with a broadly linear central portion; stamens 4; capsule 2-seeded.—Low hills and valleys.

4. *P. bigelovii* Gray. Stems 7 to 12 cm. high; herbage very slightly hairy; leaves linear or thread-like, commonly shorter than the stems which bear narrowly linear spikes; stamens 2; capsule 4-seeded, the seeds winged at one end.—Alkaline fields.

RUBIACEAE. MADDER FAMILY

Shrubs or herbs with opposite or whorled leaves. Flowers perfect or polygamous, rarely unisexual. Corolla commonly 4-lobed. Stamens 4. Calyx adnate to the ovary.—This is a very large natural family consisting of 4500 species distributed in all parts of the earth. It is important economically as including Coffee (*Coffea arabica* L.) Quinine (*Cinchona officinalis* L., *C. ledgeriana* Moens, and other species), Ipecac (*Uragoga ipecacuanha* Baill.) and other plants.

Herbs (or only slightly woody); flowers in cymes or solitary; corolla rotate.....

1. GALIUM.

Shrubs; flowers in globose heads; corolla funnelform.....2. CEPHALANTHUS.

1. GALIUM L. BEDSTRAW. CLEAVERS

Mostly herbs with slender square stems. Flowers cymose. Ovary 2-lobed, 2-celled, 2-ovuled; styles 2. (Greek gala, milk, certain species being used to curdle milk.)

Leaves 6 to 8 in a whorl; coarse plants, mostly simple, erect, or reclining and diffuse.

Annual, with a taproot; fruit densely hispid with short hooked bristles.....

1. *G. aparine*.

Perennial, from slender creeping rootstocks; fruit densely white-hispid with long hairs.....2. *G. triflorum*.

Leaves 4 in a whorl; perennial with woody rootstocks.

Plants forming low dense tufts, 4.8 to 12 cm. high; flowers solitary or in 3s; leaves narrowly linear-subulate, acerose, glabrous.....

3. *G. andrewsii*.

Plants with the stems more open, always taller; flowers, at least the fertile, solitary; leaves mostly ovate to oblong.

Stems slender at the base, 7 to 19 cm. long; herbage hispid-ciliate.....

4. *G. californicum*.

Stems often coarsely woody at base, 5 to 14 dm. long, climbing; herbage glabrous to decidedly scabrous.....5. *G. nuttallii*.

1. *G. aparine* L. GOOSE-GRASS. Diffuse or climbing over herbaceous plants, or erect and low; herbage hispidulous, roughened; leaves 1.2 to 3 cm. long; fruit 2 to 3 mm. in diameter.—Common in shady or grassy places among the hills; widely distributed.

2. *G. triflorum* Michx. SWEET-SCENTED BEDSTRAW. Slender, erect or reclining, 2 to 4 dm. high, with leafy stems; leaves in whorls of 6; flowers 2 or 3 in a cyme; fruit less than 2 mm. in diameter.—Woody thickets, North Coast Ranges.

3. *G. andrewsii* Gray. Plants commonly densely matted; flowering stems erect, the prostrate stems rooting at the joints; herbage grayish; leaves 4 to 9 mm. long; flowers perfect; fruit glabrous, berry-like.—High dry ridges of the inner ranges.

4. *G. californicum* H. & A. Plants 7 to 19 cm. high, erect or diffuse; leaves ovate, 4 to 10 mm. long; flowers dioeciously polygamous, the perfect axillary, the sterile ones terminal; fruit glabrous or nearly so.—Common on open hills of the Coast Ranges.

5. *G. nuttallii* Gray. Branches often tinged red or purple, very leafy; leaves oval to linear-oblong, thickish, 2 to 8 mm. long; flowers perfect; fruit glabrous.—Common in thickets, Coast Ranges.

2. CEPHALANTHUS L.

Shrub. Leaves opposite or in 3s, with stipules. Flowers white, in dense globose heads. Calyx inversely pyramidal, its limb 4-toothed. Corolla slender-funnelform, its limb 4-cleft. Style filiform, exserted. Fruit obpyramidal, at length splitting into 2 to 4 one-seeded portions. (Greek kephale, head, and anthos, flower.)

1. *C. occidentalis* L. BUTTON-WILLOW. Two to 8 m. high; leaves oblong-ovate, 6.6 to 7.8 cm. long; heads 1.8 to 2.4 cm. broad, long-peduncled.—Banks of interior streams.

CAPRIFOLIACEAE. HONEYSUCKLE FAMILY

Erect or twining shrubs with opposite leaves. Calyx-tube adnate to ovary, the toothed limb commonly insignificant. Corolla regular or irregular, 5 (or 4)-lobed. Stamens as many as the lobes of the corolla, inserted on its tube or base. Ovary 2 to 5-celled. Style 1. Fruit a berry or berry-like.—Species about 320, mostly north temperate zone.

Leaves pinnately compound; corolla rotate, regular.....1. *SAMBUCUS*.
Leaves simple.

Corolla regular; berry white.....2. *SYMPHORICARPOS*.

Corolla tubular, 2-lipped or regular; berry red or black.....3. *LONICERA*.

1. *SAMBUCUS* L. ELDER

Shrubs or small trees with pinnate leaves and serrate leaflets. Flowers small, white, in a terminal compound cyme. Corolla regular, rotate, deeply 5-lobed. Ovary 3 to 5-celled. Style short. Stigmas 3 to 5. (Greek sambuke, a musical instrument, said to have been made of elder wood.)

Cyme flat-topped; berries blue.....1. *S. glauca*.

Cyme dome-shaped or ovate; berries red.....2. *S. racemosa*.

1. *S. glauca* Nutt. BLUE ELDERBERRY. Bushy or tree-like, 1 to 4 m. high; leaflets 5 to 7, lanceolate to ovate or obovate; flowers in a flat-

topped cyme; berry blue with a bloom.—Stream banks in the valleys or in open woods in the hills. The berries are used in rural cookery.

2. **S. racemosa** L. RED ELDERBERRY. Thick spreading bush 3 to 9 dm. high; leaflets mostly obovate or oblong, glabrous or nearly so, entire at apex; berries scarlet.—Mountains. Var. *CALLICARPA* Jepson. Low shrub or small tree, 2.4 to 6 m. high; leaflets sharply serrate to apex.—Seacoast, San Mateo Co. n.

2. SYMPHORICARPOS L. WAX-BERRY

Low branching bushes with small short-petioled simple leaves and white or pinkish flowers in short close clusters. Calyx with a globular tube and 4- or 5-toothed limb. Corolla regular, bell-shaped or tubular, 4- or 5-lobed. Stamens included. Ovary 4-celled. Fruit a white berry. (Greek *sumphoreo*, to bear together, and *karpos*, fruit, the berries in close clusters.)

1. **S. racemosus** Michx. SNOW BERRY. About 9 to 15 dm. high; leaves roundish to oblong, entire or lobed; corolla pinkish, 4 mm. long, densely hairy within; berry 8 to 14 mm. in diameter, white with snowy pulp; seeds 2.—Common in the hill country.

3. LONICERA L. HONEYSUCKLE

Erect or twining shrubs. Leaves simple, entire. Calyx-tube ovoid or globose, the border 5-toothed or truncate. Corolla strongly 2-lipped or nearly regular, its tube elongated and more or less swollen or gibbous at base. Ovary 2 or 3-celled. (Adam Lonitzer, a German herbalist of the 16th century.)

Erect deciduous shrubs; flowers in axillary pairs; corolla nearly regular; berries black.....1. *L. involucrata*.
 Trailing or twining evergreen shrubs; flowers sessile, in whorls; flowers in terminal spikes; corolla 2-lipped, the upper lip 4-lobed or toothed, the lower narrow, entire; berries red or sometimes yellow.
 Leaves next the inflorescence united into a connate-perfoliate disk.
 Corolla pink, hispidulous-glandular without; leaves with stipule-like appendages.....2. *L. hispidula*.
 Corolla yellow, glabrous without; leaves without stipule-like appendages.. 3. *L. interrupta*.
 Leaves all distinct; corolla yellow.....4. *L. subspicata*.

1. **L. involucrata** (Richards) Banks. BLACK TWIN-BERRY. About 1 to 2 m. high; leaves oblong-ovate or -lanceolate; peduncles axillary, bearing at summit 2 flowers (side by side) which are subtended by conspicuous bracts; corolla yellow or crimson-tinged, 1.8 cm. long.—Along cañon streams.

2. **L. hispidula** Dougl. var. **californica** (Greene) Jepson. CALIFORNIA HONEYSUCKLE. Climbing on bushes or trees by twining of the stem; leaves broadly oblong or ovate, most of the opposite pairs joined at base by stipule-like appendages, the uppermost beneath the inflorescence completely united by their bases; flowers in whorls, the whorls in terminal spikes; corolla pink, 12 to 16 mm. long.—Along streams in cañons and valleys.

3. **L. interrupta** Benth. CHAPARRAL HONEYSUCKLE. Stems twining or reclining; corolla 8 to 10 mm. long.—High chaparral-covered ridges.

4. **L. subspicata** H. & A. MORONEL. Stems climbing or reclining, 1

to 3.7 m. long, or sometimes an erect thickety shrub 1.2 to 1.8 m. high; uppermost as well as lower leaves distinct, often very narrow; spikes borne in a panicle.—Mesas and valleys, S. Cal.

DIPSACEAE. TEASEL FAMILY

Herbs with opposite leaves. Flowers in dense heads or short spikes. Calyx-tube adnate to the ovary. Corolla 4 or 5-lobed, borne on the calyx. Stamens 4 (or 2 by abortion). Ovary 1-celled; style filiform. Fruit an achene, crowned with the persistent calyx.—Species about 150, especially in the Mediterranean region and the Orient.

1. DIPSACUS L.

Biennial. Cauline leaves united at base. Flowers pinkish-white, the short spike surrounded by an involucre of elongated bracts much surpassing the pointed bracts subtending the flowers. Bracts in fruit very rigid and spine-like. Calyx-limb cup-shaped, 4-toothed. Corolla 4-lobed. Achene surrounded by a 4 to 8-ribbed involucre. (Greek name of the Teasel.)

1. *D. fullonum* L. FULLER'S TEASEL. Stems erect, stout, coarse, prickly, 8 to 14 dm. high.—Abundant in low waste lands; nat. from Eur.

LOBELIACEAE. LOBELIA FAMILY

Herbs with alternate entire leaves and complete flowers in racemes. Calyx-tube adnate to the ovary, the free portion divided into 5 distinct lobes. Corolla 2-lipped with 2 lobes in upper lip and 3 in lower. Stamens 5; anthers and filaments united into a tube about the single style. Ovary 2-celled, becoming a 1 or 2-celled capsule with many seeds.—About 500 species, especially in the tropics.

1. DOWNINGIA Torr.

Dwarf herbs. Calyx-tube long and stalk-like. Corolla-tube short, its limb ample. (A. J. Downing, an American horticulturist.)

Lower lip of the corolla concave; stamen-column long-exserted, the anther-tube much incurved.....1. *D. elegans*.

Lower lip of the corolla plane, forming a platform; stamen-column little or not at all exserted; anther-tube straight or only slightly curved.

Sinuses of corolla not cut below platform.....2. *D. pulchella*.

Sinuses of corolla cut below platform.

Lobes of upper lip of corolla coiled into a ring; calyx-lobes ascending.....

3. *D. ornatissima*.

Lobes of upper lip of corolla not coiled; calyx-lobes rotate..4. *D. concolor*.

1. *D. elegans* (Lindl.) Torr. Stem 9.6 to 29 cm. high; leaves 1.2 to 1.8 cm. long; corolla light blue, veiny, its tube short-campanulate; lower lip 3-lobed at apex.—Margins of vernal pools.

2. *D. pulchella* Torr. Erect or ascending, 5 to 24 cm. high; leaves 1.2 cm. long; corolla deep bright blue, its tube 2 mm. long; lower lip 1.2 cm. broad, bearing 2 obovate yellow spots.—Low plains and salt marshes.

3. *D. ornatissima* Greene. Simple or branched from the base, 5 to 15 cm. high; leaves linear; corolla very light blue, lower lip bearing 2 yellow spots; stamen-column slightly exserted.—Low spots in the plains.

4. *D. concolor* Greene. Nearly simple or branched from the base. 2.4 to 9.6 cm. high; flowers 8 to 9 mm. broad; corolla blue, the lower lip with a velvety quadrate spot; stamen-column included. — Abundant locally in low places.

COMPOSITAE

SUNFLOWER FAMILY

Herbs or shrubs. Flowers collected in a head surrounded by 1 to several rows of bracts (involucre), the marginal flowers (rays) frequently with strap-shaped and very conspicuous corollas, the inner flowers (forming the disk) with tubular 5-toothed corollas, or sometimes all the flowers with strap-corollas. Calyx in the form of hairs, bristles, scales or teeth. Stamens 5, united by their anthers. Style 2-cleft at apex. Ovary inferior, 1-celled, becoming a dry achene.—This family, with about 12,000 species distributed all over the earth but most numerous in temperate climes, is the second largest family of flowering plants, being exceeded only by Orchidaceae. It vastly exceeds Orchidaceae, however, in number of individuals. The family contains plants which yield fats, oils, tannins and medicinal drugs, but is not very important economically. It furnishes a large number of agricultural pests which are especially hard to combat on account of the means which Compositae possess for effective seed dispersal.

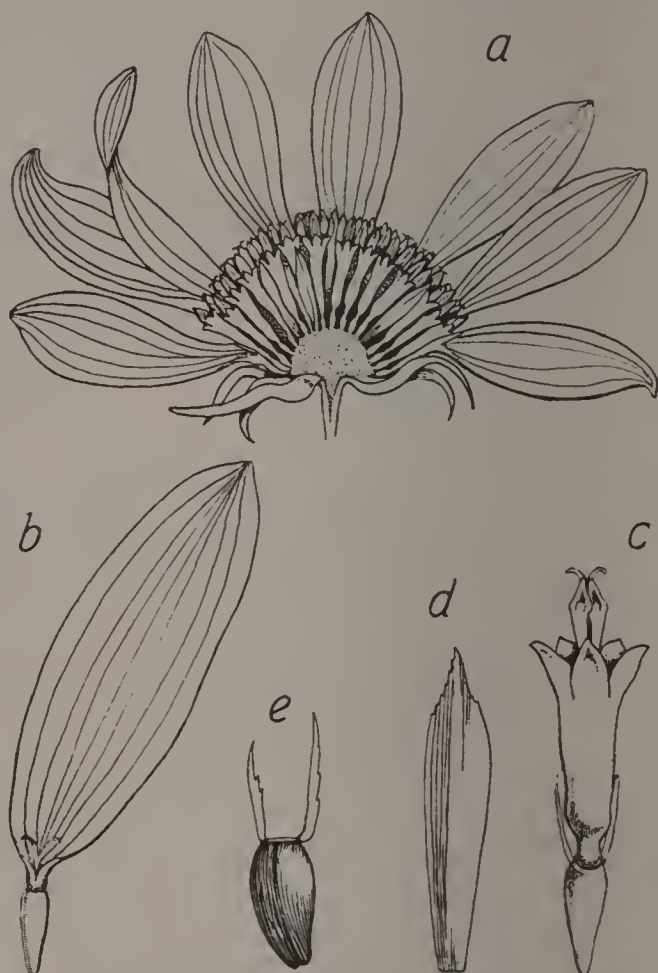


Fig. 7. A typical flower head of Compositae. To the beginner a flower head in this family looks like a single flower, but on examination it is seen to consist of a large number of flowers closely packed together as shown in the above illustration of California Sunflower, *Helianthus californicus* DC.; *a*, long. sect. of head $\times \frac{3}{4}$; *b*, ray-flower $\times 1\frac{1}{2}$; *c*, disk-flower $\times 2\frac{1}{2}$; *d*, bract $\times 2\frac{1}{2}$; *e*, achene and pappus (calyx) $\times 2\frac{1}{2}$.

A. Plants without milky juice; disk-flowers without ligulate corollas.

I. STYLE BRANCHES NAKED OR PROLONGED INTO A FLATTENED HAIRY OR PUBESCENT APPENDAGE.

Rays mostly present; pappus of awns or bristles; anthers blunt at the base; style-branches appendaged; herbage sometimes gummy or resinous; leaves alternate; receptacle naked; bracts of the involucre well imbricated; disk-flowers yellow.—**ASTERAE** (Aster Tribe).

Rays present (sometimes inconspicuous); flowers yellow, white, lavender or purple; mostly herbs.

Flowers of both disk and ray yellow.

Pappus of several caducous awns or bristles; heads large and gummy; leaves not narrow, mostly serrate; perennial herbs....
1. GRINDELIA.

Pappus of persistent bristles.

Ray-achenes without pappus or the pappus a reduced crown.....
2. HETEROTHECA.

Ray-achenes (when present) with pappus like that of disk.

Herbs; rays present; pappus dull white.....3. SOLIDAGO.

Evergreen shrubs; rays present or absent; pappus in age reddish.....4. ERICAMERIA.

Flowers of the disk yellow (sometimes changing to purple); rays never yellow.

Bracts of the involucre mostly in 2 or more series, usually with herbaceous tips; rays usually numerous; perennial or annual herbs.....5. ASTER.

Bracts of the involucre in 1 or 2 series, without distinctly herbaceous tips; rays very numerous and narrow; perennial or biennial herbs.....6. ERIGERON.

Rays none; flowers whitish or yellowish, dioecious; mostly shrubs.....
7. BACCHARIS.

Rays none; pappus of capillary bristles; anthers caudate at base; style-branches naked; herbage mostly white-woolly; leaves alternate, entire; heads small; bracts of the involucre scarious; pistillate flowers mostly with filiform corollas.—INULEAE (Everlasting Tribe).

Flowers dioecious; involucre bracts white.....8. ANAPHALIS.

Flowers all fertile, perfect and pistillate in the same head; involucre bracts white, pink or purplish.....9. GNAPHALIUM.

II. STYLE-BRANCHES TRUNCATE OR HAIRY-APPENDAGED OR WITH A RING OF BRISTLES BELOW.

1. *Receptacle with chaffy bracts or naked; anthers mostly rounded at the base.*

Pappus not hair-like.

Involucre bracts not scarious.

Receptacle with chaffy bracts.

Rays present; disk-flowers perfect.

Involucre of 1 to several series of bracts, none enfolding ray-achenes; involucre bracts herbaceous or foliaceous; receptacle very chaffy; leaves mostly opposite or basal; pappus paleaceous, of rigid awns, or cup-like; style-branches truncate or hairy-appendaged; anthers not caudate.—HELIANTHEAE (Sunflower Tribe).

Bracts of the involucre in several series; leaves broad; achenes thick, not wing-margined.

Ray-flowers maturing achenes; low perennials with broad basal leaves.....10. WYETHIA.

Ray-flowers not maturing achenes; tall annuals or perennials with alternate leaves.....

11. HELIANTHUS.

Bracts of the involucre in a dissimilar series; leaves chiefly basal or alternate, dissected into narrowly linear or filiform lobes; achenes flattened, more or less wing-margined.....12. COREOPSIS.

Involucre of 1 series of equal bracts each enfolding a ray achene; bracts of receptacle often in 1 series between ray and disk; leaves alternate or opposite; herbage glandular, viscid; ray-achenes without pappus, that of disk-achenes paleaceous, awn-like or none; styles and anthers as in Heliantheae.—MADIEAE (Tarweed Tribe).

Ray-achenes laterally compressed, completely enfolded by the deeply sulcate bracts of the involucre, which are strongly carinate on the back.....13. MADIA.

Ray-achenes turgid, obcompressed or clavate.

- Ray-achenes half enclosed by the bracts of the involucre which are rounded on the back, the bracts at length deciduous.....14. HEMIZONIA.
- Ray-achenes completely enfolded by the bracts of the involucre, which at base have thin margins and flattish backs.
- Achenes in fruit not expanding; pappus present or none; flowers yellow, white, or yellow and white.....15. LAYIA.
- Achenes in fruit expanding into a globose head; pappus silvery-scarious; flowers golden-yellow.....16. ACHYRACHAENA.
- Rays none; heads unisexual, small, greenish or white; pappus none; leaves alternate or the lowest opposite; fruit commonly a bur; anthers distinct; styles as in Heliantheae; coarse weeds. AMBROSIEAE (Ragweed Tribe).
- Heads containing both staminate and pistillate flowers, the latter at the margin; involucre of 4 or 5 rounded united bracts.....17. IVA.
- Heads unisexual, both pistillate and staminate on the same plant; involucre of pistillate heads closed and bur-like, only the style-branches exerted; staminate heads in a raceme or spike, their involucre open.
- Involucral bracts of the staminate heads united; pistillate involucre beaked at apex and armed near the beak with a single row of short prickles....18. AMBROSIA.
- Involucral bracts of the staminate heads distinct; pistillate involucre maturing into a stout bur..19. XANTHIUM.
- Receptacle naked; bracts of involucre in 1, 2 or more series, little imbricated; flowers yellow; rays present; pappus of paleae, awns, bristles, or none.—HELENIEAE (Sneezeweed Tribe).
- Leaves opposite; herbage glabrous or pubescent, never white-woolly. Bracts of the involucre distinct; pappus of paleae or bristles or both or none.....20. BAERIA.
- Bracts of the involucre united into a toothed cup.....21. LASTHENIA.
- Leaves alternate; herbage glabrous or white-woolly.
- Ray-corollas with a toothed appendage at base opposite the ligule; pappus none; leaves entire or denticulate; annuals.....22. MONOLOPIA.
- Ray-corollas without appendage at base; pappus present; perennials.
- Bracts of the involucre erect; leaves divided or incised.....23. ERIOPHYLLUM.
- Bracts of the involucre reflexed; leaves not divided, often decurrent.....24. HELENIUM.
- Involucral bracts scarious; pappus none or reduced to a mere crown or ring; flower white, yellow or greenish; rays present or absent; leaves alternate, usually much divided; strong-scented or aromatic plants.—ANTHEMIDEAE (Mayweed Tribe).
- Receptacle with chaff-like bracts.
- Heads solitary, terminating leafy branches or peduncles; rays 14 to 20; annual.....25. ANTHEMIS.
- Heads in a terminal corymb; rays 4 or 5; perennial....26. ACHILLEA.
- Receptacle naked.
- Marginal flowers without a corolla; heads discoid.....27. COTULA.
- All of the flowers with a corolla; heads in paniced racemes or spikes, small.....28. ARTEMISIA.
- Pappus hair-like; bracts of the involucre little or not at all imbricated, in 1 or 2 rows; receptacle naked; flowers yellow; leaves alternate or basal; pappus bristles soft, copious, mostly white; anthers not caudate.—SENECIONEAE (Groundsel Tribe).

- Leaves chiefly opposite; heads large; pappus of rather rigid and strongly roughened bristles.....29. *ARNICA*.
 Leaves alternate; heads large or small; pappus of abundant soft hairs.....30. *SENECIO*.

2. *Receptacle covered with bristles; anthers mostly caudate at the base; plants thistle-like, with alternate prickly leaves; heads large; involucre bracts imbricated, usually prolonged into a spine or bristle, or with membranous edges; flowers conspicuous; rays none; corolla tubular, deeply cleft; style-branches unappendaged, smooth or with a pubescent ring below.*—*CYNAREAE* (Thistle Tribe).

Achenes inserted on the receptacle by their very base.

Filaments distinct; pappus of plumose bristles, united at base and deciduous in a ring.

Bristles of the pappus in a single series; achenes not angled.....31. *CIRSIUM*.

Bristles of the pappus in several series; achenes somewhat 4 angled.....32. *CYNARA*.

Filaments united below; pappus of narrow barbellate paleae.....33. *SILYBUM*.

Achenes obliquely or somewhat laterally inserted on the receptacle; pappus-bristles or scales in 2 or 3 rows or none.....34. *CENTAUREA*.

B. Plants with milky juice; both disk and ray-flowers with ligulate corollas.—*CICHORIEAE* (Chicory Tribe).

Pappus of bristles, the bristles (or some of them) plumose.

Receptacle with chaff-like bracts; at least the inner achenes beaked; flowers yellow; stems naked; leaves basal.....35. *HYPOCHAERIS*.

Receptacle naked.

Bracts of involucre in 2 unlike series.

At least the inner achenes with a slender beak, all the achenes ribbed; flowers yellow; low branching thistle-like biennial....36. *PICRIS*.

Achenes not beaked nor ribbed; flowers pink; tall annuals, paniculately branching above.....37. *STEPHANOMERIA*.

Bracts of the involucre in 1 series, united at the base; at least the inner achenes with a slender beak, all the achenes ribbed; flowers purple; perennial or biennial with grass-like leaves.....38. *TRAGOPOGON*.

Pappus of fine soft capillary bristles, scabrous but never plumose.

Achenes not beaked; receptacle naked or bristly.

Achenes not flattened; stems commonly branching or the plants with the leaves all basal.....39. *MALACOTHRIX*.

Achenes flattened; leafy-stemmed plants.....40. *SONCHUS*.

Achenes beaked; receptacle naked.

Achenes flattened; leafy-stemmed plants; heads in a panicle.....41. *LACTUCA*.

Achenes not flattened; leaves all basal; heads solitary.....42. *AGOSERIS*.

1. *GRINDELIA* Willd. GUM PLANT

Coarse perennial herbs, sometimes woody at base. Heads usually gummy. Involucre campanulate or hemispherical, the bracts many-ranked, often with attenuate squarrose points. Pappus of 2 to 8 deciduous awns or scales. Involucral cups of budding heads filled with the gummy exudation. (H. Grindel, Russian botanist.)

Involucre hemispherical, with conspicuous foliaceous bracts.....1. *G. robusta*.
 Involucre urnshaped-campanulate, without foliaceous bracts.....2. *G. camporum*.

1. *G. robusta* Nutt. var. *maritima* Jepson. GUM PLANT. Stems erect, 2.8 to 5.7 dm. high; leaves oblong to ovate or lanceolate, serrate or the upper entire; heads few in a terminal cyme; bracts foliaceous; mature

achenes with a 1 to 5-dentate often oblique border at summit.—Along the seaboard, Los Angeles to San Francisco.

2. **G. camporum** Greene. WHITE-STEM GRINDELIA. Stems usually several from base, simple or branching above, 2 to 7 dm. high; leaves oblong to oblanceolate, clasping, serrate; heads solitary or loosely corymbose; achenes with 2 pappus-bristles.—Inner foothills and interior plains.

2. HETEROTHECA Cass.

Tall hairy perennial herbs with alternate leaves and heads of yellow flowers in a terminal corymbose panicle. Involucre broadly oblong, its narrow bracts imbricated. Ray and disk-flowers numerous. Ray-achenes triangular; pappus none. Disk-achenes compressed, pappus double. (Greek heteros, different, and theke, a case or ovary, the achenes of disk and ray dissimilar.)

1. **H. grandiflora** Nutt. TELEGRAPH WEED. Stems mostly simple below, 5.7 to 14 dm. high; leaves ovate to oblong, the lower petioled, the upper sessile; heads rather large; pappus brick-red in age; outer pappus of disk-flowers inconspicuous.—S. Cal., n. to the Great Valley.

3. SOLIDAGO L. GOLDEN ROD

Perennial herbs with alternate leaves. Heads small, the clusters in a pyramidal or spike-like panicle, or corymbose. Bracts of the involucre narrow, thin, imbricated in 2 or more series. Flowers yellow. Pappus of capillary bristles. Achenes terete or angular. (Latin, solidus, and ago, to unite firmly, certain species reputed to have wound-healing properties.)

Stems branching; flower clusters corymbose.....1. *S. occidentalis*.
Stems simple; flowers in a terminal panicle.....2. *S. californica*.

1. **S. occidentalis** Nutt. WESTERN GOLDEN ROD. Stems 8 to 14 dm. high, very leafy, paniculately branching, the branches terminated by corymbose clusters of small heads; herbage glabrous; leaves linear or nearly so, sprinkled with clear dots.—Marshes, stream beds and river banks.

2. **S. californica** Nutt. COMMON GOLDEN ROD. Stem simple below the terminal panicle, 5 to 11 dm. high; herbage minutely pubescent; leaves oblong, the lower serrate; panicle dense, not leafy, 9.6 to 31 cm. long.—Dry plains or hillsides or in the mountains.

4. ERICAMERIA Nutt.

Ours low evergreen shrubs with linear or terete often heath-like leaves. Foliage punctate, resin-bearing. Flowers yellow, the heads in terminal clusters. Rays present or none. Involucre turbinate, its bracts imbricated. Pappus-bristles slender, dull white or yellowish, in age reddish. (The minute evergreen leaves of some species resemble those of *Erica*.)

1. **E. ericoides** (Less.) Jepson. DUNE-HEATH. Low heather-like shrub 3 to 5 dm. high, with decumbent main stems and many erect branchlets; leaves linear-terete, crowded or fascicled, heads corymbose-paniculate; corolla with dilated throat.—Sand dunes along the coast.

2. **E. arborescens** (Gray) Greene. GOLDEN FLEECE. Erect shrub with fastigiate branches, 8 to 14 dm. high; leaves numerous, narrowly

linear, becoming filiform, 3.6 to 4.8 cm. long; rays none or rarely present.—Higher Coast Range hills; Sierra Nevada.

5. ASTER L. ASTER

Herbs. Heads usually numerous, paniculate, corymbose or racemose, sometimes solitary. Involucre campanulate to hemispherical. Bracts in several ranks, often imbricated, foliaceous or merely green-tipped. Disk-flowers yellow, sometimes changing to purple or brown. Receptacle flat. Pappus of simple capillary bristles. (Greek *astere*, a star, from the star-like head of flowers.)

1. **A. chilensis** Nees. COMMON ASTER. Stems 5 to 10 dm. high, villos-pubescent or more or less glabrous; leaves lanceolate, sessile, entire, the basal oblong-spatulate, remotely serrate and petioled, all with scabrous-ciliolate margins; involucre bracts green-tipped; rays white, lavender or bluish.—Coastal region.

6. ERIGERON L. FLEABANE

Herbs with generally sessile leaves and solitary, paniculate or corymbose heads. Disk-flowers yellow, ray-flowers usually numerous, white, purple or yellow, the ligules filiform. Involucral bracts narrow, little imbricated. Receptacle flat or convex. Pappus of simple capillary bristles. (Greek *eri*, early, and *geron*, an old man, "old man in spring.")

1. **E. canadense** L. HORSEWEED. Stems paniculately branching, 5.7 to 14 dm. high; leaves linear to lanceolate; heads very numerous in a many-branched panicle; involucre bracts scarious-margined; rays inconspicuous, white.—Waste or half-cultivated lands; nat. from Eur.

7. BACCHARIS L.

Perennial herbs or shrubs, commonly resinous or glutinous, with striate or angled branches. Heads discoid, many-flowered, borne singly or in clusters. Involucre imbricated. Flowers whitish or yellowish, dioecious. Staminate flowers with tubular corolla. Pistillate flowers with thread-like corolla. Pappus of capillary bristles. (The god Bacchus.)

Achenes 10-nerved; leaves obovate.....1. *B. pilularis*.
Achenes 5-nerved.

Shrubs; leaves willow-like.....2. *B. viminea*.

Herbs; leaves resinous.....3. *B. douglasii*.

1. **B. pilularis** DC. COYOTE BRUSH. CHAPARRAL BROOM. Shrub 10 to 17 dm. high; leaves sessile, 6 to 24 mm. long; heads subglobose; involucre bracts oblong; pappus minutely scabrous, dilated at apex into a bent lanceolate appendage.—Low hills, high mountain slopes or coast sand dunes.

2. **B. viminea** DC. MULE FAT. Leafy shrub with many slender branching stems 11 to 23 dm. high; leaves lanceolate or oblong; heads narrow, clustered; involucre bracts broadly lanceolate with scarious margins; pappus nearly smooth.—Beds of flood streams and rivers.

3. **B. douglasii** DC. Stems simple, 11 to 14 dm. high; herbage glutinous; leaves lanceolate, acute, serrate; heads numerous in a terminal compound corymb; involucre bracts linear or lanceolate-linear with greenish center.—Moist lowlands from San Francisco Bay southw.

8. **ANAPHALIS** DC. EVERLASTING

Perennial herbs with simple erect leafy stems. Leaves green above, woolly beneath. Heads in a compound corymb. Involucral bracts dull white, scarious, imbricated in several series. Flowers yellow, dioecious. (Ancient Greek name of some "Everlasting.")

1. **A. margaritacea** (L.) B. & H. PEARLY EVERLASTING. Stems several from the base, 3 to 5.7 dm. high; herbage woolly; leaves lanceolate, sessile, with revolute margin.—Open woods.

9. **GNAPHALIUM** L. CUDWEED

Woolly herbs with entire sessile or decurrent leaves. Heads discoid, white, yellowish, or rose-tinted, in panicles, corymbs or spikes. Involucral bracts imbricated, scarious. Pappus a single series of capillary bristles. (Greek gnaphalon, a lock of wool, these plants floccose-woolly.)

Pappus-bristles united at base, falling together; inflorescence spike-like.....

1. *G. purpureum*.

Pappus-bristles not united at base, falling separately; inflorescence corymbose, paniculate or cymose.

Involucre imbedded in loose wool; bracts rather inconspicuous....2. *G. palustre*.

Involucre woolly only at base; bracts conspicuous.

Herbage in age becoming green, more or less glandular.

Inflorescence corymbose; bracts shining white.....3. *G. decurrens*.

Inflorescence paniculate or cymose; bracts white or rose-tinged.....

4. *G. ramosissimum*.

Herbage persistently woolly, not glandular or scarcely so.....

5. *G. microcephalum*.

1. **G. purpureum** L. PURPLE CUDWEED. Stems simple, erect from a slightly decumbent base, 9.6 to 29 cm. high; herbage canescent, upper surface of leaves early glabrate; leaves broadly spatulate, 2.4 to 4.8 cm. long; involucre brownish or purplish.—Open ground.

2. **G. palustre** Nutt. LOWLAND CUDWEED. Stems erect or ascending, 7 to 19 cm. high; wool loosely floccose deciduous from the leaves; leaves mostly spatulate, 1.2 to 2.4 cm. long; involucral bracts imbedded in loose wool.—Stream beds and lowlands.

3. **G. decurrens** Ives var. **californicum** Gray. CALIFORNIA EVERLASTING. Stems stoutish, 5 to 9 dm. high, corymbosely branched at summit; herbage soon becoming green, at maturity balsamic-scented; leaves oblong to lanceolate, decurrent; involucral bracts shining white.—Dry wooded hills of the Coast Ranges.

4. **G. ramosissimum** Nutt. PINK EVERLASTING. Stems 1 to several from the base, 6 to 14 dm. high, ending in a much-branched panicle; herbage glandular and sweet-scented; heads reddish or pinkish.—Wooded hills near the coast; Sierra Nevada.

5. **G. microcephalum** Nutt. WHITE EVERLASTING. Stems 4 to 7 dm. high, branching above into a panicle; herbage bright white-woolly; leaves linear; panicles often 2.8 dm. long; involucral bracts white.—Wooded mountain slopes.

10. **WYETHIA** Nutt.

Perennial herbs with a basal tuft of leaves and simple stems with few and smaller leaves and one or few large heads. Involucre hemispherical, its bracts in 2 or 3 unlike series, the outer large, the inner small. Ray and disk-flowers yellow. Pappus a crown of unequal scales or with rigid

awns at the angles. (Capt. Nath. J. Wyeth, with whom Thos. Nuttall crossed the continent in 1834.)

Heads relatively small; bracts of the involucre shorter than or little surpassing the disk.....1. *W. angustifolia*.

Heads very large and broad; outer bracts of the involucre much surpassing the disk.

Herbage minutely or floccose tomentose.....2. *W. helenioides*.

Herbage glabrous but minutely resinous.....3. *W. glabra*.

1. **W. angustifolia** Nutt. Stems 2.8 to 5.7 dm. high; leaves elongated-lanceolate to oblong-ovate, mostly entire; involucre bracts numerous, oblong-ovate to linear, ciliate; rays 4.2 to 4.8 cm. long; achenes bearing 1 or 2 or more stout awns with some chaffy scales.—Open plains and low hills.

2. **W. helenioides** Nutt. Stems 2.8 to 5.7 dm. high; basal leaves large, stem leaves much smaller; heads 7.2 cm. broad, including rays; outer bracts of involucre ovate-lanceolate or ovate.—Foothills and bordering plains.

3. **W. glabra** Gray. MULE-EARS. Similar to no. 2; herbage green and glabrous throughout; achenes and pappus glabrous.—Open hills, Napa Co. to San Luis Obispo Co.

11. HELIANTHUS L. SUNFLOWER

Stout coarse herbs with simple leaves, all but the lowest alternate. Heads large. Rays yellow. Disk brownish. Bracts of the involucre imbricated. Bracts of the receptacle persistent, embracing the 4-sided achenes. Pappus consisting of pointed paleae borne at the angles of the achene. (Greek helios, sun, and anthos, flower, the heads turning towards the sun.)

Annuals; receptacle flat or nearly so.

Involucre bracts ovate, abruptly attenuate.....1. *H. annuus*.

Involucre bracts lanceolate, gradually attenuate.....2. *H. bolanderi*.

Perennials; receptacle convex to low-conical; bracts with long spreading tail-like tips.....3. *H. californicus*.

1. **H. annuus** L. COMMON SUNFLOWER. Stems simple or branching, 8.6 to 23 dm. high; herbage rough-hispid; leaves deltoid-ovate, serrate, the upper narrow and often entire; bracts of the involucre ovate, slenderly acuminate; rays 2.4 to 3.6 cm. long.—Native of America; it has been cultivated from remote antiquity, but the wild ancestor is unknown. It runs wild in Cal. from cultivation.

2. **H. bolanderi** Gray. Stems erect or branching, scabrous-hispid, 2.8 to 8.6 dm. high; leaves ovate to oblong-lanceolate, serrate or entire; rays 1.6 cm. long; disk purple; bracts of the involucre hirsute, oblong-lanceolate, acuminate.—Low grain fields of the Sacramento Valley, w. to the coast.

3. **H. californicus** DC. CALIFORNIA SUNFLOWER. Fig. 7. Stems from somewhat tuber-like roots, 1 to 3 m. high; leaves oblong to lanceolate, the larger 3-ribbed; bracts of involucre lanceolate, with long tail-like tips; rays 2.4 cm. or more long.—Stream beds and banks, Coast Ranges, Great Valley.

12. COREOPSIS Cav.

Ours annuals. Leaves dissected, all basal or nearly so. Flowers yel-

low, in showy heads on long naked peduncles. Involucre double; bracts of the inner series erect, membranous, of the outer series loose and foliaceous. Achenes flattened, more or less wing-margined. (Greek, an ornament.)

1. **C. calliopsidea** (DC.) Gray. Leafy, 2.8 to 5.7 dm. high; bracts of outer series broadly ovate, those of the inner narrowly ovate; pappus paleae 2, linear.—Moist hillsides: South Coast Ranges; S. Cal.

13. **MADIA** Mol. TARWEED

Glandular-viscid erect herbs. Leaves alternate. Heads axillary and terminal. Flowers yellow, opening in the evening. Involucre angled, the bracts in one series. Receptacle with a single row of chaffy bracts. Rays few to many. (Madi, the Chilian name.)

Receptacle glabrous; rays inconspicuous; achenes of the ray curved.....1. *M. sativa*.
Receptacle fimbriate-hirsute; rays showy; achenes of the ray not incurved.....
2. *M. elegans*.

1. **M. sativa** Mol. CHILE TARWEED. Robust, 2.8 to 11.5 dm. high, pubescent, glandular, ill-scented; leaves broadly lanceolate to linear; rays 5 to 12, with pale yellow ligules; cup of receptacle enclosing many disk-achenes.—Old fields, vacant lots and waysides; nat. from Chile.

2. **M. elegans** Don. COMMON MADIA. Stem 2.8 to 8.6 dm. high; leaves linear to linear-lanceolate, short-hirsute; herbage viscid; heads in a corymbose panicle; rays yellow or with a red spot at base.—Dry hillsides and valley fields.

14. **HEMIZONIA** DC. TARWEED

Viscid-glandular and ill-scented annuals with alternate or sometimes opposite narrow leaves. Flowers yellow or white. Disk with a circle of bracts or chaffy throughout. Ray-achenes short, thick, half enclosed by the lower part of the involucre bract. (Greek hemi, half, and zonia, zone, the bracts but half enclosing the achenes.)

Ray-achenes not beaked; flowers white.....1. *H. luzulaefolia*.
Ray-achenes beaked; flowers yellow.

Receptacle with a circle of bracts surrounding disk-flowers.

Rays 12 to 25; heads hemispherical.....2. *H. corymbosa*.

Rays 5; heads very narrow in small clusters.....3. *H. fasciculata*.

Receptacle with chaffy bracts throughout.

Rays 4 or 5; leaves ending in a truncate gland.....4. *H. virgata*.

Rays 25 to 40; leaves spinose.....5. *H. pungens*.

1. **H. luzulaefolia** DC. HAY-FIELD TARWEED. Stem freely branching, diffuse or erect, 2.8 to 5.7 dm. high; lower leaves crowded, more or less tufted, narrowly linear, canescent; heads numerous; outer bracts of receptacle united into a cup.—Mowed hay fields and pasture lands.

2. **H. corymbosa** (DC.) T. & G. COAST TARWEED. Corymbosely and widely branching, 3 to 4 dm. high; basal leaves pinnately divided, the upper linear; pappus minute or none.—Valley fields and hillsides, Berkeley to Monterey Co.

3. **H. fasciculata** (DC.) T. & G. Paniculately branched, 2.2 to 5.7 dm. high; basal leaves pinnately parted, the stem leaves linear; heads fascicled in rather dense small clusters; pappus of linear paleae.—Mt. Diablo to S. Cal.

4. *H. virgata* Gray. Stem branching at middle into virgate branches bearing numerous racemously disposed heads on short lateral branchlets; leaves linear.—Plains of the Great Valley and valleys of the inner South Coast Ranges; s. to S. Cal.

5. *H. pungens* T. & G. COMMON SPIKEWEED. Stems branching, 2.8 to 8.6 dm. high; leaves linear-subulate, spinose, entire, the lower pinnately parted; pappus none.—Plains of the Great Valley and s. to S. Cal. Often covering tens of thousands of acres on the alkaline plains and forming dense spiny thickets. It is a valued bee plant in the San Joaquin and many tons of spikeweed honey are produced.

15. LAYIA H. & A.

Annuals with alternate leaves and showy heads of flowers. Ray-flowers 8 to 20, yellow or white, or yellow tipped with white. Disk-flowers yellow. Bracts in a single row, herbaceous, the thin margins at base enfolding the achene. Receptacle broad and flat, with a row of thin bracts between ray and disk-flowers. Ray-achenes without pappus. Disk-achenes with a pappus of 5 to 20 paleae or bristles, rarely none. (G. T. Lay, botanist to the Beechey Expedition which visited California in 1827.)

1. *L. platyglossa* (F. & M.) Gray. TIDY TIPS. Simple or branching, 2 to 3.8 dm. high; herbage stipitate-glandular; leaves linear, entire or the lower pinnatifid; bracts of the involucre linear, denticulate-ciliate on the lower half; rays about 13, 1.2 cm. long, sulphur-yellow with white tips; achenes silky; pappus-bristles naked.—Valleys and plains.

2. *L. glandulosa* (Hook.) H. & A. Branching, 2 to 3 dm. high; leaves (and stems near the heads) with dark stipitate glands; leaves lanceolate or linear, the lower pinnatifid; rays 8 to 10, pure white, 1.2 to 1.4 cm. long; pappus-bristles 10 to 12, white, with straight hairs toward the base outside and woolly tangled hairs inside.—Hills and valleys.

16. ACHYRACHAENA Schauer

Soft-pubescent annual with narrow leaves, the lower opposite. Involucre oblong-campanulate, the bracts herbaceous, each enfolding a ray-achene. Bracts of receptacle in a single outer series. Flowers golden-yellow, aging reddish-brown. Ray-flowers 5 to 8, their ligules short and broad. Disk-achenes with pappus of silvery scales. (Greek achuron, chaff, and Latin achaenium, an achene, the very chaffy pappus conspicuous on the fruit.)

1. *A. mollis* Schauer. BLOW-WIVES. Erect, simple or branching, 2 to 4 dm. high; branches each 1-headed.—Adobe soil of plains and valleys.

17. IVA L.

Coarse perennial herbs with entire leaves, all but the lower alternate. Flowers greenish-white in small nodding spicate heads. Involucre hemispherical, its rounded bracts about 5. Receptacle with chaff-like linear bracts. Marginal flowers with tubular corollas. Disk-flowers sterile, with 5-lobed funnellform corollas. (Said to be named after *Ajuga iva* of the mint family, on account of the similar odor.)

1. *I. axillaris* Pursh. POVERTY WEED. Stems many, erect from a

decumbent or prostrate base, 1.4 to 2.4 dm. high; leaves narrowly obovate to linear, entire, sessile; heads solitary in the axils, short-peduncled; bracts of the involucre united into a lobed or toothed cup.—Alkaline plains and borders of salt marshes.

18. **AMBROSIA** L. RAGWEED

Coarse aromatic perennial herbs with alternate pinnatifid leaves. Flowers inconspicuous, unisexual. Staminate heads in catkin-like racemes; involucre broadly hemispherical, many-flowered; corollas funnel-form, 5-lobed. Pistillate heads in axils of upper leaves at the base of the staminate racemes; involucre turbinate, 1-flowered; corollas none. Pappus none. Fruit an achene-like bur armed with a single row of prickles. (Ancient Greek name.)

1. **A. psilostachys** DC. WESTERN RAGWEED. Stems simple, erect, 3 to 8.6 dm. high, from slender running rootstocks; herbage pubescent; leaves once or twice pinnatifid; fruit a bur bearing 4 protuberances, or unarmed.—Uncultivated lands.

19. **XANTHIUM** L.

Coarse branching weeds. Leaves alternate, toothed or lobed. Heads unisexual. Staminate heads subglobose, in a terminal cluster, many-flowered; involucre a single row of distinct narrow bracts; corollas tubular. Pistillate heads axillary; involucre closed, 2-flowered; corolla none. Pappus none. Fruit a bur covered with hooked prickles. (Greek *xanthion*, yellow, from its yielding a hair-dye of that color.)

1. **X. spinosum** L. SPINY CLOTBUR. Stems much branched, with yellowish 3-pronged spines beside the leaves; leaves lanceolate, 2 or 3-lobed or cut, green above, white pubescent beneath; corolla rusty-pubescent; bur sparsely prickly.—Barnyards and neglected fields; nat. from Eur.

2. **X. canadense** Mill. COCKLE BUR. Stems about 3 to 6 dm. high, not prickly; leaves deltoid-ovate, irregularly serrate or incised, often 3-lobed, rough, green on both sides; bur glandular-pubescent on the body, spiny, bearing at apex a pair of strong beaks hooked or incurved at tips.—Low or marshy lands; nat. from the eastern U. S.

20. **BAERIA** F. & M. GOLD FIELDS

Low mostly slender commonly hairy annuals. Leaves opposite, linear. Flowers yellow. Rays 5 to 15, showy or short. Involucre hemispherical, its bracts as many as the rays. Receptacle subulate-conical. Pappus of paleae or awns or both or none. (The Russian zoologist, Baer.)

1. **B. chrysostoma** F. & M. GOLD FIELDS. Stems slender, simple or branching, 1.2 to 2.6 dm. high; leaves narrowly linear, entire; achenes smooth, shining or papillate; pappus typically none.—Lower foothills and valley plains. Var. *GRACILIS* Hall. Achenes more or less strigose-pubescent; pappus of 3 or 4 awns from small lanceolate paleae, sometimes none.—Mid. Cal. to S. Cal.

21. **LASTHENIA** Cass.

Glabrous annuals with opposite entire sessile leaves. Flowers yellow, with 5 to 15 rays. Bracts of involucre more or less united into a toothed cup. Receptacle conical, covered with points which bear the

achenes. Pappus of 5 to 10 paleae or none. (Named for a Greek girl who attended the lectures of Plato in the garb of a man.)

1. *L. glabrata* Lindl. Usually branching above the base, 2.6 to 3.8 dm. high; leaves linear and entire or the upper pair broadly lanceolate and toothed, connate and sheath-like at base; peduncles elongated; pappus present.—Borders of salt marshes.

22. MONOLOPIA DC.

White-woolly annuals with alternate sessile entire or low-denticulate leaves and large peduncled heads of golden yellow flowers. Involucre hemispherical. Receptacle conical, naked. Rays with the ligule 3 or 4-toothed at apex and bearing at base and opposite the ligule an oblong or roundish denticulate appendage. Achenes angular, black. Pappus none. (Greek mono, single, and lopus, husk, on account of the bracts of the involucre in one series.)

1. *M. major* DC. Simple or branching, 2 to 4 dm. high; bracts of the involucre united into a broadly campanulate cup with triangular teeth; rays 6 to 20 mm. long.—Valleys.

23. ERIOPHYLLUM Lag.

White-woolly herbs. Leaves alternate, divided or entire. Involucre oblong to hemispherical, its bracts rigid and erect. Receptacle flat. Rays broad, 4 to 15, or none. Achenes linear. Pappus of firm pointless paleae or none. (Greek erion, wool, and phullon, leaf, the herbage woolly.)

1. *E. staechadifolium* Lag. LIZARD TAIL. Diffuse, 5.7 to 8.6 dm. high; leaves pinnately parted into 5 or 7 lobes, margins revolute, under surface white with a felt-like tomentum, upper surface green; heads in compact corymbs; involucre broadly oblong, 5 to 6 mm. high; rays 6 to 8; paleae unequal.—Sandy hills and fields near the ocean.

2. *E. confertiflorum* (DC.) Gray. Stems 3.6 to 5.7 dm. high, with a dense deciduous tomentum; leaves small, ternately or pinnately parted into 3 to 7 linear divisions; heads in compact terminal clusters; involucre 3 to 4 mm. high; rays 4 to 5; paleae nearly equal.—Hill and mountain summits, Coast Ranges, s. to S. Cal.

24. HELENIUM L. SNEEZEWEED

Erect herbs with resinous-dotted herbage. Leaves alternate, the upper sessile, mostly decurrent on the stem. Heads solitary or corymbose on long naked peduncles. Flowers golden-yellow, the disk-corollas turning yellowish or brown. Bracts of the involucre linear, reflexed. Receptacles globose or hemispherical. Pappus of 5 to 12 short-pointed paleae. (Greek name of some plant, perhaps named after Helenus, son of Priam.)

1. *H. puberulum* DC. ROSILLA. Paniculately branched, 5.7 to 14 dm. high; leaves lanceolate or linear, sessile, decurrent on the stem; rays reflexed; inconspicuous; disk-flowers red-brown.—Creek beds, stream banks and about springy places.

25. ANTHEMIS L. CHAMOMILE

Ill-scented branching herbs with finely dissected alternate leaves. Heads solitary, on terminal peduncles. Ray-flowers white, sterile. Disk-flowers yellow. Bracts scarious, margined with a greenish nerve, at length dry,

imbricated in several series. Receptacle conical, chaffy toward the summit. Pappus none. (Ancient Greek name of the chamomile.)

1. **A. cotula** L. DOG-FENNEL. Plants 3 to 8.5 dm. high; heads 1.8 cm. broad; rays 14 to 20, at length reflexed.—Nat. from Eur., a weed in waste lands. Also called Mayweed and Trailweed.

26. **ACHILLEA** L. YARROW

Perennial herbs with alternate leaves pinnately divided into many fine segments. Heads in a terminal corymb. Rays few, white. Disk-flowers yellow. Involucre oblong or ovoid, its bracts imbricated, with scarious margins. Receptacle chaffy, nearly flat. Achenes flattened. Pappus none. (In honor of Achilles.)

1. **A. millefolium** L. COMMON YARROW. Stem simple, 5.8 to 8.6 dm. high; rays 4 or 5.—Seashore to the mountains. Also called Milfoil.

27. **COTULA** L.

Low strong-scented herbs. Leaves alternate, lobed, dissected or entire. Flowers yellow. Bracts of involucre greenish, in about 2 ranks. Outer series of flowers pistillate only, long-pedicelated; corolla none. Disk-flowers with 4-toothed corollas, shortly pedicelated or sessile. Pappus none. (Greek kotule, small cup or low vessel.)

1. **C. coronopifolia** L. BRASS BUTTONS. Perennial, somewhat succulent, often subaquatic; stems decumbent, 1.4 to 2.8 dm. long; heads depressed, 8 to 10 mm. broad.—Saline flats, salt marshes and springy places in the hills. It is one of the first plants to take possession of reclaimed mud flats.

28. **ARTEMISIA** L. SAGE-BRUSH

Herbs or shrubs, mostly bitter and aromatic, with alternate leaves. Heads small, in paniced spikes or racemes. Flowers yellow or purplish. Rays none. Involucre imbricated, dry and scarious. Pappus none. (Named after Artemisia, wife of Mausolus, king of Caria.)

Flowers all fertile; style 2-cleft.

Shrubs; achenes with a minute crown-shaped pappus; herbage grayish-pubescent; leaves filiform, entire or with linear filiform divisions.....

1. *A. californica*.

Herbs; achenes wholly destitute of pappus; leaves green above, broad, entire or incised.....

2. *A. heterophylla*.

Only the marginal pistillate flowers fertile; style mostly entire.

Leaves dissected; herbage densely silky villous.....

3. *A. pycnocephala*.

Leaves linear, entire; herbage glabrous.....

4. *A. dracunculoides*.

1. **A. californica** Less. OLD MAN. Gray shrub 1.2 to 11.5 dm. high; leaves minutely pubescent, the lowest once or twice parted into linear-filiform segments, the upper entire and more or less fascicled; heads in long racemose panicles; pappus minute, squamellate, crown-shaped.—Exposed slopes of hills.

2. **A. heterophylla** Nutt. CALIFORNIA MUGWORT. Stems from running rootstocks, erect, woody at base, strict, 8.6 to 17 dm. high; leaves lanceolate to elliptic, entire or sparingly pinnatifid or cleft, green above, glabrous or white-tomentose beneath; heads mostly erect; marginal flowers pistillate, disk-flowers perfect.—Along stream banks and elsewhere.

3. *A. pycnocephala* DC. Stems stout, simple, 4 to 6.5 dm. high; leaves once or twice divided into linear lobes; inflorescence a dense virgate panicle; involucre villous.—Sand hills along the coast.

4. *A. dracunculoides* Pursh. Stems branched, 5.8 to 13 dm. high; leaves linear, entire or the lowermost 3-toothed or -cleft; marginal flowers fertile, disk-flowers perfect but sterile.—S. Cal., Sierra Nevada, e. and n.

29. *ARNICA* L.

Montane herbs, somewhat glandular or aromatic. Stems single, bearing 1 to several large heads at summit. Leaves mostly opposite. Involucre broadly campanulate; bracts somewhat in 2 ranks. Receptacle flat, naked. Disk- and ray-flowers yellow. Achenes slender, with a callous knob at base. Pappus a single row of strongly roughened white bristles. (Origin of name obscure.)

1. *A. discoidea* Benth. COAST ARNICA. Plants 3.6 to 5.4 dm. high, glandular-pubescent above; leaves ovate or oblong, dentate, petioled; cauline leaves sessile; rays none.—Dry open woods.

30. *SENECIO* L. GROUNDSEL

Herbs with alternate leaves and heads in terminal corymbs, rarely solitary. Heads many-flowered. Disk- and ray-flowers yellow. Involucre cylindrical to campanulate. Bracts of equal length in 1 or 2 rows. Achenes terete. Pappus of abundant white soft hairs. (Latin *senex*, an old man, on account of the white hair-like pappus.)

Perennials.

Stems numerous and nearly equably leafy; leaves or their divisions linear to filiform.....1. *S. douglasii*.

Stems few-leaved, naked above or the upper leaves reduced.

Stems tall and simple, from a coarsely fibrous cluster of roots.....

2. *S. hydrophilus*.

Stems several or in tufts, from creeping rootstocks.....3. *S. aronicoides*.

Annuals; rays none or minute; involucre black-tipped.....4. *S. vulgaris*.

1. *S. douglasii* DC. CREEK SENECIO. Bush 5 to 15 dm. high; herbage at first whitish-tomentose, later glabrate; involucre broadly turbinate, the bracts linear with attenuate tips; rays about 15.—Dry stream beds or moist swales.

2. *S. hydrophilus* Nutt. Stem purplish, 6 to 15 dm. high; herbage glabrous; leaves fleshy-coriaceous, entire or nearly so; lower leaves short-petioled, the upper sessile or partly clasping; heads numerous; rays none or rarely few.—Marshes about San Francisco Bay and n.

3. *S. aronicoides* DC. Stem robust, 3 to 8.5 dm. high; heads many or few; leaves ovate to oblong, the upper auricled at base; rays none, rarely 1 or 2.—Thickets or sparsely chaparral-covered country.

4. *S. vulgaris* L. COMMON GROUNDSEL. Stem simple or branching, 1 to 3 dm. high; leaves pinnatifid with jagged margin; heads in terminal corymbs; involucre cylindrical, with conspicuously black-tipped small bracts at base.—Common weed from Eur.

31. *CIRSIUM* Scop. THISTLE

Stout herbs. Leaves alternate, prickly or spiny-toothed or pinnatifid. Head with numerous crimson, white, or yellowish flowers, all tubular. Involucre spherical to cylindrical, the bracts imbricated, usually tipped

with a prickle. Receptacle with soft bristles. Pappus of 1 series of bristles. (Kirsion, Greek name of a kind of thistle.)

Stem spinose-winged by decurrent leaf-bases.....1. *C. lanceolatum*.
Stem not spinose-winged.

Center and middle series of involucre bracts entire.

Bracts with closely appressed base and widely spreading upper portion,
this straight or incurved.....2. *C. coulteri*.

Bracts straight, festooned with cobwebby hairs.....3. *C. occidentale*.

At least the outer series of involucre bracts fimbriate or pinnately spinose.....
4. *C. edule*.

1. ***C. lanceolatum*** (L.) Scop. BULL THISTLE. Spreading, 5.7 to 10 dm. high; leaves lanceolate, deeply pinnatifid, midrib and veins spiny, base decurrent into interrupted prickly wings; upper surface strigose-setulose; involucre bracts with prickly pointed spreading tips; flowers rose-purple.—Waste lands and pastures; nat. from Eur.

2. ***C. coulteri*** (Gray) Jepson. Stems branching, 10 to 20 dm. high; herbage white-tomentose or becoming green; leaves pinnately parted, upper lanceolate; involucre little woolly or nearly glabrous; flowers bright crimson.—Coast Ranges and southern Sierra Nevada.

3. ***C. occidentale*** (Nutt.) Jepson. Stout, 4 to 8.5 dm. high, white with thick coating of wool; leaves lanceolate to oblong, not very prickly, often glabrate above; involucre bracts straight, furnished with spines and cobwebby hairs; flowers red or purple.—Sand hills near the coast.

4. ***C. edule*** Nutt. INDIAN THISTLE. Stem simple, robust but succulent, 10 to 17 dm. high; leaves thin, tomentose below, narrowly oblong to oblanceolate, shallowly sinuate-pinnatifid, prickly-ciliate; involucre woolly when young, glabrate in age; outermost bracts foliaceous, pinnately spinose; flowers dull-purple or whitish.—Along creeks and gulches in Coast Ranges.

32. **CYNARA** Vaill.

Stout herb with pinnatifid or bipinnatifid leaves. Flowers blue. Heads very large, globose. Involucre bracts broadly ovate. Receptacle fleshy. Pappus of many series of plumose bristles. (From the Greek *kuon*, a dog, the spines of the involucre being likened to a dog's teeth.)

1. ***C. scolymus*** L. ARTICHOKE. Plant 3 to 8 dm. high; herbage more or less tomentose; leaves bipinnatifid, the acute lobes scarcely spinose; inner involucre bracts with scarious tips, the outer with thickened tips.—Cult. from Eur., sometimes run wild.

33. **SILYBUM** Gaertn.

Herbs. Leaves ample, sinuate-pinnatifid, prickly, clasping, smooth and shining above and very conspicuously blotched with white along the veins. Heads very large, solitary. Bracts of the involucre broad, bearing an abruptly spreading ovate or lanceolate spine. Flowers purple. Corolla with filiform tube conspicuously dilated below the narrowly linear lobes. Pappus-bristles in several series. (Old Greek name applied to thistle-like plants.)

1. ***S. marianum*** Gaertn. MILK THISTLE. Leaves 4.3 to 7.2 dm. long, 1.4 to 2.8 dm. wide, strongly undulate at the sinuses; heads about 4.8 to 6 cm. broad.—Naturalized in waste places; native of the Mediterranean region.

34. **CENTAUREA** L. STAR THISTLE

Rigid herbs with alternate leaves which are not prickly. Involucre ovoid or globose, the bracts imbricated and ending in a needle-like prickle. Receptacle with dense persistent bristles. Flowers yellow or purple, all tubular. Pappus of 2 or 3 rows of bristles or short scales. (Named for one of the Centaurs who used it in healing.)

Flowers yellow; leaves decurrent on the stem.

Annual; plants erect, branching mostly above the base.....1. *C. melitensis*.

Perennial; plants diffuse, branching from the base.....2. *C. solstitialis*.

Flowers purple or blue; leaves not decurrent.....3. *C. calcitrapa*.

1. **C. melitensis** L. NAPA THISTLE. Erect branching annual, 3 to 6 dm. high, the stem winged by the decurrent leaves; lowest leaves pinnatifid, the upper mostly entire; flowers yellow; pappus-bristles in about 3 rows.—Common weed of agricultural lands, nat. from Eur.

2. **C. solstitialis** L. YELLOW STAR THISTLE. Diffuse, branching from the base, 3 to 7 dm. high, cottony pubescent; basal leaves pinnatifid, cauline linear, decurrent; flowers bright yellow.—Nat. from Eur., a highly noxious thistle of cultivated field and open lands, causing great loss to agricultural interests. When botanists first made known its presence in California it could have been exterminated for less than a hundred dollars; at the present time millions of dollars would not suffice.

3. **C. calcitrapa** L. PURPLE STAR THISTLE. Dense bushy plants 7 to 11 dm. high; leaves pinnately divided or the uppermost undivided; flowers purple; achenes without pappus.—Nat. from Eur.; a highly offensive alien, making taller and denser spiny thickets of growth than no. 2, but keeping mostly to uncultivated land. Its presence as a dangerous weed was made known by botanists in 1885.

35. **HYPOCHAERIS** L.

Herbs with naked stems bearing a solitary head or a somewhat corymbose cluster of long-peduncled heads. Flowers yellow. Leaves in a basal rosette. Involucre campanulate or cylindrical, its bracts rather few, lanceolate, imbricated. Achenes 10-ribbed, narrowly oblong, tapering into a slender beak. Pappus of plumose bristles. (Greek name used by Theophrastus for some cichoriaceous plant.)

1. **H. glabra** L. SMOOTH CAT'S-EAR. Stems several, erect, mostly corymbosely branched, 1.4 to 3.8 dm. high; leaves broadest above; heads campanulate.—Cult. fields and pasture lands, a widely spread weed; nat. from Eur.

36. **PICRIS** L.

Coarse rough-bristly biennial with leafy stems. Heads terminal or along the branches. Flowers yellow. Outer bracts of involucre loose and spreading, inner bracts erect. Achene somewhat flattened, with a long beak. Pappus of densely plumose bristles. (Greek pikros, bitter.)

1. **P. echinodes** L. BRISTLY OX-TONGUE. Stems branching, 2.8 to 8.6 dm. high, hispid with barbed hairs; leaves narrowly oblong, sessile, rough-hispid.—Open fields and waste grounds, an offensive weed; nat. from Eur.

37. **STEPHANOMERIA** Nutt.

Usually tall and rather slender herbs, paniculately branching above. Leaves runcinate or entire. Heads small. Flowers pink or flesh color, open in the early morning. Ligules all equal. Involucre cylindrical. Achenes strongly angled. Pappus-bristles white or brownish, plumose. (Greek stephane, a wreath, and meros, a division, referring to the virgate branches.)

1. **S. virgata** Benth. Stem rigid, virgate or with virgate branches. 3 to 12 dm. high; upper leaves linear, lower oblong or spatulate; heads sessile or on slender bracteate peduncles along the branches.—Open cañon sides and ridges.

38. **TRAGOPOGON** L.

Stout glabrous herbs, somewhat succulent. Leaves grass-like, entire, clasping. Heads large, long-peduncled, open only in the forenoon. Flowers purple. Involucral bracts in 1 series. Achenes muricate, 5 to 10-ribbed, long-beaked. Pappus-bristles long-plumose. (Greek tragos, a goat, and pogon, a beard.)

1. **T. porrifolius** L. SALSIFY. Stems from a stout taproot, leafy at base, 5.7 to 11.5 dm. high; leaves linear-lanceolate, 2.8 dm. or more long.—Cult. from Eur. for its edible root; also sparingly naturalized.

39. **MALACOTHRIX** DC.

Herbs with leafy or almost naked stems. Heads peduncled. Flowers yellow, white, or pinkish. Achenes short, ribbed at apex, with an entire or denticulate border. Pappus-bristles soft, more or less united at base and falling together. (Greek malakos, soft, and thrix, hair, in reference to the long wool on *M. californica*, type of the genus.)

Involucre imbricated in several series; bracts linear to orbicular, scarious.....
 Involucre little imbricated; bracts lanceolate to linear, not obviously scarious-margined.....

1. *M. coulteri*.

2. *M. obtusa*.

1. **M. coulteri** Gray. SNAKE'S HEAD. Simple or branching from the base, 1.2 to 4.8 dm. high; lower leaves narrowly oblong, the upper ovate to lanceolate, sessile; involucral bracts silvery-scarious with a dark median line; pappus-bristles 1 to 4, persistent.—San Joaquin Valley to S. Cal.

2. **M. obtusa** Benth. Stems 1 to 3.8 dm. high, nearly naked; basal leaves often bearing tufts of wool on the margin; none of the pappus-bristles persistent.—Higher mountain slopes.

40. **SONCHUS** L. SOW-THISTLE

Leafy-stemmed coarse annual weeds. Heads corymbed or umbellate, swollen at base. Involucral bracts with many shorter ones at base. Achenes obcompressed, not beaked. Pappus copious, of cottony-white hairs, mainly falling together. (Greek name of the Sow-Thistle.)

Leaves when sessile sagittate-clasping; peduncles glabrous; achenes longitudinally ribbed and transversely rugose.....
 Leaves when sessile usually auriculate-clasping; peduncles hispid; achenes with 3 ribs on each side, the intervals smooth.....

1. *S. oleraceus*.

2. *S. asper*.

1. **S. oleraceus** L. COMMON SOW-THISTLE. Stem erect, nearly simple. 2.8 to 11.5 dm. high; leaves lyrate or runcinately pinnatifid, the ter-

minal segment large and triangular, lower petioled, upper sessile.—Old fields and waste places; nat. from Eur.

2. **S. asper** L. PRICKLY SOW-THISTLE. Similar to no. 1; leaves sometimes undivided.—Old fields and waste places; nat. from Eur.

41. **LACTUCA** L. LETTUCE

Tall leafy-stemmed annuals or biennials with paniced heads of yellow or purple flowers. Leaves alternate. Involucral bracts imbricated in 2 or more series of unequal lengths. Rays 5-toothed. Pappus of soft white capillary hairs which fall separately. (Ancient Latin, from lac, milk, referring to the milky juice.)

1. **L. scariola** L. PRICKLY LETTUCE. Stems paniculately branched above, 5.7 to 14 dm. high; leaves oblong or oblong-lanceolate, pinnatifid, sessile or clasping, with a row of soft prickles on the lower side of the midrib; heads numerous; rays cream-yellow.—Introduced from Europe; roadsides, waste places and grain fields. Cows are fond of the green herbage.

2. **L. sativa** L. GARDEN LETTUCE. Similar to no. 1 but with unarmed midrib.—Cult. from Eur. as a salad plant for man.

42. **AGOSERIS** Raf.

Herbs, the stems naked and scape-like, bearing single large heads. Leaves in a basal tuft, elongated. Flowers yellow. Involucre campanulate, its bracts imbricated. Achenes 10-ribbed, prolonged into a filiform beak. Pappus-bristles fine, copious. (Greek agos, chief, and seris, lettuce.)

1. **A. heterophylla** (Nutt.) Greene. Annual; stems slender, 7.2 to 28.8 cm. high; herbage villous-pubescent; leaves linear to oblong, entire, denticulate or sinuate pinnatifid; involucral bracts lanceolate-acuminate; achenes 2 to 4 mm. long; beak 4 to 8 mm. long.—S. Cal.; Sierra Nevada, North Coast Ranges.

2. **A. plebeia** Greene. Perennial; stems stout, 3.8 to 4.8 dm. high; herbage hirsute-pubescent to glabrate; leaves lanceolate or spatulate, entire, dentate, lacinate or lobed; achenes 5 to 6 mm. long, the beak 14 to 20 mm. long.—San Francisco Bay region to S. Cal.

CLASS II.—MONOCOTYLEDONS

ALISMACEAE. WATER PLANTAIN FAMILY

Marsh or aquatic herbs with basal leaves, scape-like flower stems and perfect or unisexual flowers. Perianth of 3 outer herbaceous persistent sepals and 3 inner white delicate deciduous petals. Stamens 6 to many or numerous. Ovaries numerous, distinct, 1-celled, 1-ovuled, becoming achenes in fruit. Endosperm none; embryo strongly recurved or folded.—Species about 50, temperate and tropic zones.

Achenes verticillate in a single whorl; stamens 6.....1. ALISMA.
Achenes crowded on a globose receptacle; stamens numerous.....2. SAGITTARIA.

1. **ALISMA** L.

Erect perennial herbs. Inflorescence a panicle of whorled branches each bearing a simple or compound umbel of perfect flowers. Petals small, scarcely exceeding the sepals. Stamens 6, with short filaments. Achenes numerous, crowded in a whorl. (Alisma, the Greek name.)

1. **A. plantago** L. WATER PLANTAIN. Plants 5.7 to 11.5 (or 17) dm. high; rootstock becoming almost bulbous by the sheathing bases of the petioles; leaf-blades ovate to oblong, abruptly acute, the larger often subcordate at base.—Margins of ponds, rivers and lakes.

2. **SAGITTARIA** L. ARROW-HEAD

Marsh or aquatic perennial herbs with thickened or tuberous rootstocks, fibrous roots and milky juice. Leaves sheathing the stem at base; earlier leaves (phyllodia) destitute of blades, later producing small entire blades or most commonly sagittate blades. Flowers pediceled, borne in whorls of 3 on the upper part of the stem, with membranous bracts. Flowers monoecious (rarely dioecious), the staminate above. Petals longer than the sepals. Stamens numerous, inserted above the receptacle. Ovaries numerous, crowded on a globose receptacle. Achenes flat, winged or margined, beaked by the short style. (Latin sagitta, an arrow, referring to the shape of the leaves.)

1. **S. latifolia** Willd. TULE POTATO. Leaf-blades sagittate, very variable in outline and size, 4.8 to 28 cm. long; basal lobes lanceolate to broadly ovate, acuminate, commonly divaricate, $\frac{1}{2}$ to as long as the terminal lobe; scape simple or branched, 7.2 to 86 cm. high; achene 3 mm. long.—Rivers and deltas.

TYPHACEAE. CAT-TAIL FAMILY

Marsh or water herbs with linear leaves, staminate and pistillate flowers in a terminal compact cylindrical spike, and no calyx nor corolla. Ovary 1-celled, becoming a 1-seeded nut-like fruit.—About 12 species in the tropical and temperate zones.

1. **TYPHA** L.

Tall herbs with large grass-like leaves sheathing the base of the simple stem and terminated by a long and very dense cylindrical spike of flowers, the upper part staminate and wilting, the lower part pistillate, very compact and persistent. (Ancient Greek name of the cat-tail.)

1. **T. latifolia** L. CAT-TAIL. Stem 11.5 to 17 dm. high; pistillate portion of spike dark brown.—Marshes or marshy places along streams.

PALMACEAE. PALM FAMILY

Commonly trees with columnar unbranched trunks covered with leaf-scars or the bases of leaf-stalks and bearing a tuft of large leaves at summit. Leaves sharply plaited when young, eventually tearing more or less along the lines of the folds. Flowers minute, borne in a large panicle enclosed by a spathe. Fruit a berry, drupe or nut.—The Palm Family, represented by about 1200 species in the warm regions of the earth, is one of the most important families of seed plants; the economic value of

palms cannot well be overestimated. They furnish fibre, timber, sugar, starch, oils, fats, resin and wine, while the date palm supplies millions of human beings with their daily food in Arabia and in nearly the whole of Africa north of the equator. In addition to the fruit nearly every part of the date tree is converted to useful purpose.

Leaves fan-shaped; flowers perfect.....1. WASHINGTONIA.
Leaves pinnate; flowers dioecious.....2. PHOENIX.

1. WASHINGTONIA Wendl. FAN PALM

Trees with fan-shaped much folded blades and long petioles armed with stout hooked spines along the margins. Fruit a berry. (In honor of President Washington.)

1. *W. filifera* Wendl. CALIFORNIA FAN PALM. Columnar tree 5 to 22 m. high, sometimes clothed to the ground with dead leaf-bases; leaves 8.6 to 17 dm. long; berries black, oval, 6 to 7 mm. long.—Moist spots, easterly and northerly sides of the Colorado Desert; cult. as an avenue tree.

2. PHOENIX L.

Trees. Leaves pinnate, spreading, recurved, folded upwards and lengthwise; petioles spiny. Fruit a berry or drupe. (The old Greek name, perhaps from the Egyptian phoenix, the tree again sending up a living green tuft after fire.)

Leaves rather robust, coarse.....1. *P. dactylifera*.
Leaves very slender, graceful.....2. *P. canariensis*.

1. *P. dactylifera* L. DATE PALM. Stem erect, 20 to 30 m. high; leaves glaucous, rather robust, coarse; leaflets linear-lanceolate, 2 to 3.8 dm. long, strongly complicate; fruit cylindrical-elliptical, 2.4 to 4.8 cm. long.—Cult. from Arabia. Date orchards are an important industry in the Coachella Desert in Riverside Co.

2. *P. canariensis* Hort. CANARY PALM. Like no. 1 but more slender and graceful in all its parts; leaves very slender, green, more numerous; leaf-stalks greenish yellow.—Cult. from Canary Isls. as an ornamental tree.

LILIACEAE. LILY FAMILY

Perennial herbs, rarely shrubs or trees. Stems from bulbs, corms or rootstocks. Flowers regular. Perianth with 6 lobes or segments. Stamens 6. Styles 1 or 3. Ovary superior, 3-celled, becoming a capsule or berry.—Species about 1700, in all parts of the world. The family includes a few food plants, some bast-fibre plants (Phormium tenax or New Zealand Flax) and a large number of ornamentals.

A. Fruit a pod.

Herbs.

Styles 3 and distinct; perianth-segments white with green glands at base.....
1. ZYGADENUS.

Style 1, entire or 3-lobed or 3-parted.

Plants without rootstocks.

Stems from a tunicated bulb or corm.

Flowers with bracts.

Flowers not in umbels.

- Flowers in a loose terminal raceme.....2. CAMASSIA.
 Flowers in panicles.....3. CHLOROGALUM.
 Flowers in umbels, always with a circle of 2 or more bracts.
 Perianth-segments united below into a tube.....
 4. BRODIAEA.
 Perianth-segments distinct or nearly so.
 Bracts 2 or 3; bractlets none.....5. ALLIUM.
 Bracts 4 to 6; pedicels with minute bractlets.....
 6. MUILLA.
 Flowers without bracts; outer perianth-segments sepal-like, the
 inner petal-like.....7. CALOCHORTUS.
 Stems leafy, from a scaly bud.
 Style 3-cleft, rarely entire; anthers attached at base or below
 the middle.....8. FRITILLARIA.
 Style entire; anthers attached at middle9. LILIUM.
 Plants with vertical rootstocks; stem with a whorl of 3 leaves and a
 single flower.....10. TRILLIUM.
 Shrubs; leaves rigid, bayonet-like.....11. YUCCA.

B. Fruit a berry; plants with rootstocks.

Leaves foliaceous.

- Stem simple; flowers very small, in simple or compound racemes.....
 12. SMILACINA.
 Stem branching; flowers solitary or few in a cluster.....13. DISPORUM.
 Leaves reduced to scales; branchlets filiform.....14. ASPARAGUS.

1. ZYGADENUS Michx. ZYGADENE

Stem simple, scape-like, from a coated bulb. Leaves linear, mostly basal. Flowers greenish white, in a raceme or panicle. Perianth nearly rotate, withering-persistent. Segments ovate or oblong-lanceolate, with a green glandular spot at the narrow base. Capsule deeply 3-lobed. (Greek zugon, a yoke, and aden, a gland.)

1. **Z. venenosus** Wats. DEATH CAMAS. Plants 2 to 5.8 dm. high; leaves narrowly linear, the basal much broader; raceme broader than in no. 2, more or less compound; bracts of raceme lanceolate, much exceeding the buds; stamens equaling perianth.—Mountain and valley meadows.

2. **Z. fremontii** Wats. STAR ZYGADENE. Plants 3.5 to 7 dm. high; bulb globose or oblong, the outside coats dark; raceme narrow, mostly simple, with mostly green bracts; stamens $\frac{1}{2}$ as long as perianth; gland greenish-yellow, toothed on its upper margin.—Bushy hills and plains, common.

2. CAMASSIA Lindl. CAMASS

Stems scape-like, from a tunicated bulb, the leaves all basal. Flowers dark blue or nearly white. Pedicels jointed at the summit. Perianth-segments oblanceolate, somewhat spreading. Style slightly 3-cleft at apex. (Quamash, or camass, the name of the northwest Indians.)

1. **C. leichtlinii** Wats. Plants 2.8 to 5.7 dm. high; racemes loosely 7 to 18-flowered; perianth 1.8 to 3 cm. long; its segments 5 to 9-nerved, withering about the ovary, at length deciduous; pod oblong-obovate,

slightly notched at apex.—Meadows and marshes near the coast, Marin Co. n.

3. CHLOROGALUM Kunth.

Stems from a tunicated bulb, almost leafless, ending in a large panicle. Basal leaves long-linear, undulate. Perianth-segments 6, ribbon-like, persistent and twisted over the ovary. Stamens 6. Capsule 3-lobed. (Greek chloros, green, and gala, milk or juice.)

1. **C. pomeridianum** Kunth. SOAP PLANT. Plants 6 to 28 dm. high, the bulb with a dense coat of brown fibres; perianth-segments white, 1.6 to 2.4 cm. long.—Dry fields and hillsides. The bulb was used by the Spanish-Californians for soap.

4. BRODIAEA Sm.

Scapes from corms. Leaves basal, few and grass-like. Umbels loose or head-like. Perianth tubular, 6-lobed or -cleft. Stamens 6, or the alternate ones replaced by dilated sterile filaments or staminodia; filaments slender or more frequently winged and produced beyond the anthers in the form of thin appendages. Fruit a capsule. (James Brodie, F. L. S., Scotch botanist.)

Umbels loose.

Stamens 3, alternating with staminodia.

Scapes almost wholly subterranean; staminodia yellowish....1. *B. terrestris*.

Scapes 7.2 to 48 cm. high; staminodia white or purple.

Perianth-segments linear; throat of tube strongly constricted; staminodia purple.....2. *B. synandra*.

Perianth-segments oblong; throat of the tube little or not at all constricted; staminodia white.....3. *B. coronaria*.

Stamens 6.

Filaments filiform; stamens in 2 rows.....4. *B. laxa*.

Filaments dilated.

Flowers yellow; filaments forked at apex.....5. *B. ivioides*.

Flowers white; filaments with broadly triangular and slightly united bases.....6. *B. hyacinthina*.

Umbels capitate or congested.

Stamens commonly 3.

Flowers blue-purple; staminodia deeply parted.....7. *B. pulchella*.

Flowers rose-red or pinkish; staminodia anther-like.....8. *B. volubilis*.

Stamens 6; bracts very conspicuous.....9. *B. capitata*.

1. **B. terrestris** Kell. Scape very short, the umbel sitting on the ground; perianth purple.—Monterey to Mendocino, near the coast.

2. **B. synandra** (Hel.) Jepson. Scape 7.2 to 14.4 cm. high, bearing an umbel of 2 to 5 blue flowers on pedicels 2.4 to 6 cm. long; perianth tubular-campanulate; staminodia retuse, commonly longer than the stamens.—Dry or gravelly soil of the Sacramento or San Joaquin valleys.

3. **B. coronaria** (Salish.) Jepson. HARVEST BRODIAEA. Scape 1.6 to 4.3 dm. high; umbels 3 to 11-flowered; pedicels unequal, 2.4 to 8.4 cm. long; perianth violet-purple, 3 to 4.2 cm. long, its tube oblong with rotate or recurving segments; staminodia acute, mostly shorter than the stamens—Common on rolling plains or foothills.

4. *B. laxa* (Benth.) Wats. GRASS NUT. Fig. 8. Scape 2.8 to 5.7 dm. high, rigid, stoutish; umbel 10 to 25-flowered; perianth funnel-form, 3.6 to 4.2 cm. long, violet - purple; stamens 6, anthers 2-lobed at base, all with distinct filaments; ovary on a stipe.—Hill-slopes. Coast Ranges; Sierra Nevada. Sheep are fond of the herbage.



5. *B. ixioides* (Ait. f.) Wats. GOLDEN BRODIAEA. Scape 1.4 to 4.3 dm. high, usually scabrous; umbels 16 to 26-

Fig. 8. *Brodiaea laxa* Wats.; a, infl. $\times \frac{2}{3}$; b, long. sect. through perianth $\times \frac{2}{3}$.

flowered; pedicels 3 cm. long or less; perianth about 2 cm. long, salmon-yellow, a black-purple vein running on the outside from apex to the base of each segment; stamens alternately long and short, the anthers on a cusp in the notch.—Foothills and mountains.

6. *B. hyacinthina* (Lindl.) Baker. WHITE BRODIAEA. Scape 2.8 to 5 dm. high; umbels 20-flowered, more or less; perianth open-campanulate, cleft below the middle, white or bluish-white with green midveins, 1 to 1.4 cm. long; ovary with 3 glandular pits toward summit; pod with a short stipe.—Low moist ground.

7. *B. pulchella* (Salisb.) Greene. OOKOW. Scape 5.7 to 14 dm. high, often flexuous; heads dense, 6 to 16-flowered, subtended by 3 to 5 ovate acuminate bracts; flowers 1.4 to 1.6 cm. long; perianth-segments oblong, spreading; stamens with anthers 3; anthers bifid at each end, sessile.—Alameda Co. to Humboldt Co. and n.

8. *B. volubilis* (Kell.) Baker. SNAKE LILY. TWINING BRODIAEA. Scape 5.7 to 8.6 dm. high, twining over bushes; umbels 18 to 30-flowered; flower-tube 6 to 8 mm. long and broad, 6-angled, the angles produced into sacs near the middle; filaments and staminodia emarginate.—Hill country.

9. *B. capitata* Benth. BLUE DICKS. Scape 1.6 to 3.3 dm. high; flowers blue, 7 to 8 in a head-like umbel, with about 4 dark purple or metallic bracts; perianth 1.4 cm. long, its lobes elliptic-ovate; stamens

with anthers 6; filaments opposite inner perianth-segments with 2 lanceolate appendages extended beyond the anthers; outer filaments dilated at base only, their anthers $\frac{1}{2}$ size; appendages convergent, forming a crown over the anthers.—Hillsides.

5. ALLIUM L. ONION

Stems naked, from a tunicated bulb or corm, the linear leaves basal. Herbage with the characteristic odor and taste of onions. Flowers in a terminal umbel or head, subtended by 2 or 3 thin bracts. Perianth-segments campanulate or spreading, equal. Stamens inserted on the base of the segments. Capsule often crested. Seeds 1 or 2 in each cell. (Ancient Latin name of garlic.)

Leaves linear or grass-like, flat, not hollow.

Filaments linear or filiform, entire.

Plants with rootstocks and bulbs.....1. *A. haematochiton*.

Plants with bulbs, without rootstocks.

Outer perianth-segments only slightly wider than the inner; perianth commonly pink.....2. *A. serratum*.

Outer perianth-segments twice as wide as the inner; perianth rose-purple.....3. *A. peninsulare*.

Filaments broad, 3-cleft.....4. *A. sativum*.

Leaves terete and hollow.....5. *A. cepa*.

1. ***A. haematochiton*** Wats. Scape 1.6 to 2.8 dm. high; perianth-segments broadly ovate, acute, 6 to 8 mm. long; ovary white, truncate, with very short rounded or undulate dark red crests.—Dry hills and mountain slopes from San Luis Obispo Co. to San Diego Co.

2. ***A. serratum*** Wats. Plants 2.8 dm. high; bulb-coats with a close horizontally serrate reticulation; perianth-segments broadly ovate-lanceolate, 8 to 12 mm. long, the inner somewhat shorter than the outer and rarely serrulate; ovary and pod with wart-like crests at summit.—Open hills.

3. ***A. peninsulare*** Lemmon. Habit and bulb-coats of *A. serratum*; perianth-segments deep red-purple, 10 to 14 mm. long, the outer 3 broadly ovate-lanceolate, twice the breadth and usually $\frac{1}{4}$ longer than the three inner; ovary crests central, very minute, narrowly 2-lobed.—Barren or openly wooded hills: cismontane S. Cal.; Sierra Nevada from Kern Co. to Placer Co.; inner South Coast Range.

4. ***A. sativum*** L. GARDEN GARLIC. Bulbs clustered, pointed; leaves keeled; flowers few, purple or replaced by bulblets.—Garden plant, native of Eur. This is the species of which some nationalities are over-fond; at any rate it gives a distinctive odor to the neighborhood of their persons.

5. ***A. cepa*** L. COMMON ONION. Bulb large, depressed; scape inflated, hollow, much exceeding the leaves; flowers white, often replaced by bulblets.—Garden plant, native of Persia. Of this vegetable some persons are so extremely fond that they will risk the allegiance of friends in its behalf.

6. MUILLA Wats.

Like *Allium*, but without the taste or odor of onions. Corm fibrous-coated. Leaves very narrow, almost terete. Bracts 4 to 6, lanceolate.

Perianth greenish or yellowish white, nearly rotate. Capsule globose, seeds several in each cell. (Anagram of *Allium*.)

1. **M. maritima** (Torr.) Wats. Plants 7 to 22 cm. high; perianth without glands, segments 4 to 6 mm. long.—Alkaline fields.

2. **M. serotina** Greene. Taller, 3.3 to 4.8 dm. high; leaves fewer; perianth with very broad green veins to the segments, the inner segments with pit-like glands.—Half-open foothills; upper San Joaquin Valley; mountains of or towards the interior of S. Cal.

7. CALOCHORTUS Pursh

Stems from membranous-coated corms, the basal leaves few, long and narrow, the upper leaves small or none. Flowers very showy. Sepals greenish or colored, mostly lanceolate. Petals showy, mostly cuneate, obovate or fan-shaped, usually with a conspicuous gland or pit near the base. Capsule 3-angled or -winged. (Greek *kalos*, beautiful, and *chor-tos*, grass, in allusion to the flowers and grass-like leaves.)

Perianth globose or with inarched petals; flowers nodding; petals incurved or strongly arched; gland transversely crested or hairy; pod nodding, with acute or thin wings.—GLOBE TULIPS.

Petals white to pale pink or rose, the margins entire.....1. *C. albus*.

Petals yellow, the margins fimbriate.....2. *C. pulchellus*.

Perianth campanulate.

Flowers erect or ascending; pod nodding; stem low and flexuous.—STAR TULIPS.

Petals obovate, mostly acute, hairy all over.....3. *C. caeruleus*.

Petals fan- or wedge-shaped, rounded, hairy only near the gland.

Petals white.....4. *C. umbellatus*.

Petals lilac.....5. *C. uniflorus*.

Flowers erect, open campanulate; gland usually densely hairy; pod erect, narrow, with thick lobes; sepals often hairy or spotted within.—MARIPOSA LILIES.

Gland depressed in a pocket.....6. *C. weedii*.

Gland not depressed.

Hairs of gland linear, entire.

Flowers yellow; gland crescent-shaped.....7. *C. luteus*.

Flowers white; gland quadrate.....8. *C. venustus*.

Hairs of gland with swollen tips.....9. *C. splendens*.

1. **C. albus** Dougl. WHITE GLOBE TULIP. Stems usually branching, 2.8 to 5.7 dm. high, leafy; basal leaves long and narrow, 1.4 to 5.7 dm. long; flowers sub-globose; sepals ovate, acuminate, greenish-white; petals pure white, purplish at base, ovate-orbicular, 2.4 to 3 cm. long, with scattered silky hairs above the gland.—Wooded foothills.

2. **C. pulchellus** Dougl. GOLDEN LANTERN. Habit of no. 1; flowers yellow; petals strongly inarched, hairy within; gland bordered with stiff hairs which cross each other, visible from the outside as a projecting knob.—Wooded hills.

3. **C. caeruleus** (Kell.) Wats. var. **maweanus** Jepson. PUSSY EARS. Stem usually branching, 7.2 to 24 cm. high, leaves exceeding the stem; sepals ovate-lanceolate; petals white or pale blue, lilac-dotted and lined, a little longer than the sepals, broadly obovate or roundish, 1.2 to 2 cm. long, the upper surface with white or bluish hairs; gland covered above with a narrow transverse scale, an area immediately above the scale densely hairy.—North Coast Ranges.

4. **C. umbellatus** Wood. Stems 7.2 to 24 cm. high; basal leaf exceeding the inflorescence; sepals oblong, acuminate; petals white or slightly lilac-tinged, obovate or fan-shaped, 1.2 to 1.8 cm. long, with a hairy area on each side of the gland, otherwise naked; gland covered by an ascending appressed scale which is lightly fringed on its upper margin.—Low wooded hills about San Francisco Bay.

5. **C. uniflorus** H. & A. Stem with 1 to several bulblets below ground; flowers 2 to 10, in 1 to 3 umbels; pedicels flexuous, 7 to 24 cm. long; petals broadly cuneate, somewhat truncate, 2 to 2.4 cm. long, naked except an area immediately above the gland which is sparingly hairy; glands shallow, with a triangular appressed scale.—Open wet fields, Coast Ranges.

6. **C. weedii** Wood. WEED'S MARIPOSA. Stem 2.8 to 8.6 dm. high, usually branched; basal leaf 1, long; sepals narrowly ovate-lanceolate, often exceeding the petals; petals fan-shaped, deep yellow, 2.4 to 3.6 cm. long, covered with silky yellow hairs, each set in a brown dot; gland circular or oblong, densely matted with short hairs.—S. Cal.

7. **C. luteus** Dougl. YELLOW MARIPOSA. Stem stiffly erect, bulblet-bearing at base, 1.6 to 2.4 dm. high; basal leaves usually 2; sepals narrowly ovate-lanceolate, yellowish within; petals yellow or orange, fan-shaped, as long as broad, with or usually without a central brown blotch or "eye", slightly hairy below; gland crescent-shaped, densely hairy with ascending matted yellow hairs.—Dry hills, mid. Cal.

8. **C. venustus** Dougl. WHITE MARIPOSA LILY. Habit of no. 7; petals broadly fan-shaped, with long scattered hairs below the middle, 2.4 to 3 cm. long, white, cream-color, lilac, purple, red, or pink, with a central "eye-spot", in some forms with a red blotch above the eye; gland quadratish or longitudinally oblong, densely matted with hairs.—Mostly in the foothills.

9. **C. splendens** Dougl. LILAC MARIPOSA. Petals lilac-purple, hairy on lower third, without eye-spot; gland small, round and densely hairy.—Mt. Diablo to San Diego.

8. FRITILLARIA L.

Stems simple. Bulb with thick scales. Leaves often in whorls. Flowers in racemes, rarely solitary. Perianth campanulate, the segments distinct, each with a shallow nectary near the base. (Latin fritillus, a dice-box, on account of the shape of the flower.)

Stems leafy only on lower half, the larger leaves mostly basal.

Flowers dull white.....1. *F. liliacea*.

Flowers dark brownish or greenish-purple.....2. *F. biflora*.

Stems leafy above, the lower half or third naked.

Flowers scarlet; style cleft $\frac{1}{6}$ to $\frac{1}{5}$ its length.....3. *F. recurva*.

Flowers brownish-purple; style cleft to below the middle.....4. *F. lanceolata*.

1. **F. liliacea** Lindl. WHITE FRITILLARY. Stems 7.2 to 14.4 cm. high, 1 to 3-flowered; basal leaves oblong, upper narrower; flowers 1.2 to 1.8 cm. long.—Bleak hilltops about San Francisco Bay.

2. **F. biflora** Lindl. MISSION BELLS. Stems stout, 1.4 to 4.3 dm. high, 1 to 3-flowered; leaves borne near the base, oblong; perianth 1.8 to 2.4 cm. long.—Near the coast, San Luis Obispo to San Diego.

3. **F. recurva** Benth. SCARLET FRITILLARY. Stem 2.8 dm. high or more; leaves linear-lanceolate, mostly in 2 whorls near the middle of the stem; flowers scarlet, spotted with yellow, obtuse at base.—N. Cal. Var. **COCCINEA** Greene. Tips of segments generally not recurved, flowers acute at base.—Napa Co. to Mendocino Co.

4. **F. lanceolata** Pursh. CHECKER LILY. Perianth dark purple, mottled with greenish-yellow, 2.4 to 3.6 cm. long, the segments concave with entire margins.—Near the coast. Var. **FLORIBUNDA** Benth. Perianth conspicuously mottled, the segments with crisped margins.—Shady Coast Range woods.

9. LILIUM L. LILY

Stems simple, tall, leafy, from a scaly bulb or scaly rootstock. Leaves narrow, sessile. Flowers large and showy, in a terminal raceme. Perianth funnellform, its segments 6. Stamens 6. Capsule loculicidal. (Greek *lilium*, the classical name.)

1. **L. pardalinum** Kell. TIGER-LILY. Stems 1 to 2 m. high; perianth 4.8 to 7.2 cm. long, bright orange-red with large purple spots on lower half.—Stream banks and moist springy spots in the mountains.

10. TRILLIUM L. WAKE ROBIN

Stem from a tuberous rootstock, simple, naked below, bearing a whorl of 3 leaves and a single large flower. Leaves round-ovate, netted-veined. Perianth withering-persistent, consisting of 3 green lanceolate sepals and 3 larger colored petals. Fruit a fleshy capsule. (Latin *triplum*, triple, on account of the 3-merous flowers.)

1. **T. sessile** L. var. **giganteum** H. & A. COMMON TRILLIUM. Stem stout, 2.8 to 5 dm. high; leaves sessile; flowers sessile; petals rose-red, white or greenish.—Woods, Coast Ranges and Sierra Nevada.

2. **T. ovatum** Pursh. COAST TRILLIUM. Plants 1.9 to 2.4 dm. high; leaves on short petioles; flowers on peduncles 2.4 to 7.2 cm. long; petals white, becoming rose-red in age.—Woods near the coast.

11. YUCCA L. SPANISH BAYONET

Trees or shrubs. Leaves linear-lanceolate, rigid, sharp-pointed. Flowers in terminal panicles, the perianth-segments 6, distinct. Stamens 6. Fruit a capsule. (An Indian name for the *Manihot*.)

1. **Y. whipplei** Torr. QUIXOTE PLANT. Flowering stem 2.5 to 4 m. high; leaves in a rosette on the ground; flowers creamy-white, 3 to 3.6 cm. long; style slender with capitate stigma.—Chaparral slopes, S. Cal. and n. in South Coast Ranges and s. Sierra Nevada.

12. SMILACINA Desf. FALSE SOLOMON'S SEAL

Stem simple and leafy, from rootstocks, the small white flowers in a terminal cluster. Leaves sessile and clasping, many-nerved. Perianth persistent. Filaments subulate. Ovary ovate. Style short and thick, 3-lobed at the summit. Fruit a globose 1 to 5-seeded berry. (Latin *smilacina*, diminutive of *smilax*.)

1. **S. stellata** (L.) Desf. STAR-FLOWER. Stem usually flexuous above, 2.8 to 5.7 dm. high; leaves lanceolate or oblong-lanceolate; flowers in a simple raceme; perianth-segments twice as long as the stamens; berry

at first with 3 or 5 dark brown longitudinal stripes, later red-purple.—Shady woods. (*S. sessilifolia* Nutt.)

2. **S. amplexicaulis** Nutt. FAT SOLOMON. Stem 2.8 to 8.6 dm. high; leaves oblong-ovate to lanceolate; flowers in a panicle; perianth-segments much shorter than the broad filaments; berry light red.—Shady woods.

13. **DISPORUM** Salisb.

Stem from a rootstock, branched above and leafy. Leaves ovate, sessile, transversely veined between the primary nerves. Flowers greenish or white, campanulate, solitary or few in a terminal cluster, hanging under the leaves. Fruit a berry. (Greek *dis*, double, and *spora*, seed, some species with 2 ovules in each cell.)

1. **D. hookeri** (Torr.) Britt. FAIRY BELLS. Plants 2.8 to 7 dm. high; herbage roughish-pubescent; leaves mostly cordate at base; perianth greenish, 1.2 cm. long, the tips of the segments spreading; stamens equaling or exceeding perianth; style glabrous, entire; berry scarlet.—Shady woods near the coast.

2. **D. smithii** (Hook.) Piper. FAIRY LANTERN. Plants 2.8 to 8.6 dm. high; leaves mostly rounded or sub-cordate at base; perianth whitish, 1.8 to 2.4 cm. long, the tips of the segments erect; stamen shorter than the perianth; style short-hairy, slightly 3-cleft; berry salmon-color.—Stream banks near the coast.

14. **ASPARAGUS** L.

Stem from a rootstock, branched and with filiform branchlets clustered in the axils of the scaly leaves. Flowers solitary or in umbels or racemes. Perianth-segments alike; stamens inserted at their bases. Ovary 3-celled with 2 ovules in each cell. Fruit a berry. (Ancient Greek name.)

1. **A. officinalis** L. ASPARAGUS. Stems 8.6 to 14 dm. high, when young stout, succulent and edible; clustered branchlets 8 to 16 mm. long; flowers green, pendulous; berry red.—Cult. from Eur. Extensively grown on delta lands in Cal.

AMARYLLIDACEAE. AMARYLLIS FAMILY

Herbs or shrubs unlike Liliaceae in habit but similar to them in character save that the flower is epigynous.—Species about 650, chiefly natives of South Africa and South America.

1. **AGAVE** L. MAGUEY

Plants with a perennial rosette of fleshy leaves resting on the ground. Flowering stem arising after 10 to 40 years, depending upon situation, soil and moisture. (Greek *agauos*, noble.)

1. **A. americana** L. CENTURY PLANT. Flowering stem 3 to 5 m. high.—Cult. from Mexico. Just before flowering a plant will yield 1 or 2 gallons a day of saccharine juice; from this is made pulque, the national intoxicant of Mexico.

IRIDACEAE. IRIS FAMILY

Low perennial herbs with stout stems from rootstocks and mostly basal 2-ranked sword-like and sheathing leaves. Flowers with petal-like

perianth in 2 whorls. Stamens 3, on the base of the outer whorl. Ovary inferior, 3-celled. Fruit a capsule.—About 1000 species of wide distribution in all continents.

Stem terete; perianth-segments dissimilar.....1. IRIS.
Stem flattened; perianth-segments alike.....2. SISYRINCHIUM.

1. IRIS L. FLAG

Stems terete. Flowers large, in the axils of spathe-like bracts. Perianth-tube more or less prolonged beyond the ovary; outer segments obovate, spreading or recurved; inner segments narrower, erect. Style divided into 3 petal-like branches, each branch with 2 lobes or appendages at summit. Stigma a small projecting shelf on the outside just below the lobes. Stamens lying close beneath the style-branches. (Greek iris, the rainbow, the Greek species of the genus being celebrated for its brilliant colors.)

Dying leaves grey or yellow-brown; perianth-tube 6 mm. long; capsule 5 cm. long..

1. *I. longipetala*.

Dying leaves red-brown.

Leaves 6 mm. broad or less, not strongly ribbed.....2. *I. macrosiphon*.

Leaves 8 to 13 mm. broad, strongly ribbed.....3. *I. douglasiana*.

1. ***I. longipetala*** Herbert. COAST IRIS. Plants forming something of a mat, with erect stems; flowers 3 to 5 in a cluster, pale violet or the outer segments white and purple-veined; pedicels 1.8 to 4.2 cm. long.—Open ground, San Francisco to Monterey.

2. ***I. macrosiphon*** Torr. GROUND IRIS. Stems low, rising from the matted base; flowers 1 or 2 in a cluster, violet, very shortly pediceled; perianth-tube 3.6 to 4.8 cm. long.—San Mateo Co. and n. near the coast.

3. ***I. douglasiana*** Herbert. MOUNTAIN IRIS. Stems 3.6 to 5.7 dm. high; flowers 2 or 3 in a cluster, cream-color or bluish; pedicels about 2.4 cm. long; perianth-tube 1.2 to 2.4 cm. long.—Brushy slopes, Coast Ranges, especially n.

2. SISYRINCHIUM L.

Stems slender, flattened and more or less winged, with grass-like leaves. Flowers small, in umbels, subtended by 2 sheathing bracts and with a scarious bractlet subtending each pedicel. Perianth-divisions alike, spreading. Stamens monadelphous. (Name of Theophrastus for a bulbous plant allied to Iris.)

Flowers blue; filaments united to the top; style entire, stigmas short.....

1. *S. bellum*.

Flowers yellow; filaments united only at base; style deeply cleft.....

2. *S. californicum*.

1. ***S. bellum*** Wats. BLUE-EYED GRASS. NIGGER-BABIES. Stems somewhat branching, 2.4 to 5 dm. high; bracts inclosing about 7 flowers; perianth-segments oblong-obovate, 4 to 6 nerved, emarginate, with a slender tooth in the notch, 14 mm. long.—Open moist ground.

2. ***S. californicum*** (Ker.) Dry. GOLDEN-EYED GRASS. Stems unbranched, 1 to 3 dm. high; flowers 3 to 7 in a cluster.—San Diego to Ore.

JUNCACEAE. RUSH FAMILY

Annual or perennial herbs. Stems simple, terete, or compressed and 2-edged. Leaves alternate, sheathing, narrow, flat or terete. Flowers lily-like in structure, sedge-like in aspect, small, dry, perfect, disposed

in terminal or sometimes apparently lateral heads, spikes, corymbs or panicles. Perianth with 6 distinct similar glume-like segments. Stamens 6 or sometimes 3. Ovary superior, 3 or sometimes 1-celled; stigmas 3, filiform; ovules 3 to many. Fruit a loculicidally 3-valved capsule. Embryo minute, inclosed in fleshy endosperm.—Species about 300, widely dispersed over the earth but mostly in temperate and cold regions.

1. JUNCUS L. RUSH

Plants of swamps or wet places; herbage glabrous. Stems simple, with spongy pith or sometimes hollow, leafy, or naked and scape-like. Flowers greenish or brownish. (Classical name for the rush, perhaps from Latin *jungo*, to join, the stems used for binding.)

Inflorescence apparently lateral; involucrel bract erect, appearing like a continuous prolongation of the stem; sheaths bladeless.

Perianth greenish or dark, the segments scarious-margined; capsule oblong-ovate; common, widely distributed.....1. *J. balticus*.

Perianth pale brown, the segments not scarious-margined.

Stamens 6; capsule broadly subglobose, obtuse, apiculate....2. *J. patens*.

Stamens 3; capsule narrow, clavate, obovate, obtuse or retuse.....

3. *J. effusus*.

Inflorescence terminal; involucrel bract not a continuation of the stem (or if so, conspicuously channeled along the upper side).

Low dwarf annuals with fibrous roots; perianth-segments greenish with white scarious margins; capsule oblong.....4. *J. bufonius*.

Tall perennials; rootstocks mostly stout and creeping; perianth-segments light reddish-brown; capsule abruptly acuminate.....5. *J. rhiphioides*.

1. *J. balticus* Willd. WIRE RUSH. Plants caespitose, grass-like, 2.8 to 10 dm. high; stems terete or sometimes compressed; panicle lax, many-flowered; capsule equalling or shorter than the perianth.—Widely spread throughout Cal.

2. *J. patens* Mey. COMMON RUSH. Stems slender, densely tufted, 4.3 to 8.6 dm. high, terete; panicle lax, many-flowered; perianth-segments spreading in fruit; capsule slightly angled, a little shorter than the perianth.—Common in marshy or springy ground. This species also grows in Europe. The Latin sailors used this or a similar species, which they in the vernacular of their tongue called *juncus*, for making cordage. As the term migrated westward it became *junc* or *junk*, sailors applying it to their rations of meat on account of its toughness. It is interesting that gardeners in California who are natives of Italy gather the stems of this and allied species and cure them for tying up bunches of vegetables for the market.

3. *J. effusus* L. BOG RUSH. Fig. 9. Similar in habit to no. 2 but perianth-segments smaller and not so spreading; capsule triangular, equaling the perianth.—

Common in springy spots, hillside bogs or valley flats.



Fig. 9. *Juncus effusus* L.; a, infl. x $\frac{2}{3}$; b, perianth and capsule x 9.

4. **J. bufonius** L. TOAD RUSH. Stems commonly 2.4 to 14.4 cm. high, terete, branching from the base, leafy; leaves narrow, usually revolute and bristle-form; inflorescence a dichotomous cyme; flowers remote to subcapitate; perianth-segments exceeding the capsule.—Common in wet places or the beds of dried up pools.

5. **J. xiphioides** E. Mey. Stems flattened, 2-edged, 4.3 to 8.6 dm. high; leaves equitant; more or less obviously septate; heads 6 to 11-flowered, more or less congested; capsule equalling or exceeding the perianth.—Coastal region, salt marshes and moist lands.

CYPERACEAE. SEDGE FAMILY

Grass-like or rush-like herbs with fibrous roots, annuals, or many species, perennial by long rootstocks. Stems solid (rarely hollow), usually triangular or terete, commonly scape-like with mostly basal leaves. Leaves alternate, narrow, with closed sheaths, often 3-ranked. Flowers one in the axil of each bract (scale), borne in spikelets or spikes which are arranged in clusters, racemes, panicles or umbels. Perianth none or represented by usually 4 to 6 bristles. Stamens 1 to 3. Pistil 1; ovary 1-celled with 1 ovule, the single style with 2 or 3 stigmas. Fruit a lenticular or 3-angled achene. Embryo minute, in mealy endosperm.—A large family of 3000 species widely distributed over the earth, chiefly in marshes, of little economic importance. The foliages of the ancients were largely written on paper made from *Cyperus papyrus* L., a plant which also served to conceal little Moses in the bulrushes.

Flowers, all or at least some of them, perfect.

Spikelets flattened, the scales in 2 opposite ranks; inflorescence terminal, involucrate; flowers without bristles.....1. CYPERUS.

Spikelets cylindrical or sometimes a little flattened; perianth-bristles commonly 1 to 8.....2. SCIRPUS.

Flowers unisexual; achene enclosed in a sac or spathe.....3. CAREX.

1. CYPERUS L. GALINGALE

Stems triangular or terete, never branched, leafy at base. Inflorescence substended by a conspicuous leafy involucre, umbellate with unequal rays and a sessile central spike, or capitate. Flowers in flattened or subterete spikelets, the spikelets in capitate clusters or arranged in spikes borne on the rays. Scales concave, more or less carinate, 2-ranked. (Greek *Kupeiros*, the ancient name.)

1. **C. virens** Michx. Stems 2.8 to 8.6 dm. high; involucre bracts 4 to 6, very long and leafy, much exceeding the inflorescence; umbel compound, or the spikelets capitate on the rays, or the whole reduced and subcapitate; spikelets long-oblong, numerous, crowded; scales more or less spreading, greenish or yellowish.—Valley flats and plains in moist spots.

2. **C. rotundus** L. NUT-GRASS. Stems 1.4 to 2.8 dm. high; rootstock bearing tubers; involucre bracts 3 to 5, leafy, the longer ones equalling or little exceeding the inflorescence; umbel compound or nearly simple; spikelets linear, few, loosely clustered on the ends of the unequal rays;

scales closely, appressed, dark purple-brown or with green margins and center.—A weed in cult. lands or orchards; introd. from trop. Am.

2. **SCIRPUS** L. CLUB-RUSH. BULRUSH

Perennials or annuals. Stems leafy or the leaves reduced to mere sheaths at base. Spikelets terete or somewhat flattened, solitary or in heads, spikes or umbels, subtended by an involucre of 1 to several leaves or the involucre wanting. Perianth-bristles 1 to 6, barbed or ciliate or smooth, or none. Stamens 2 or 3. Style 2 or 3-cleft, not swollen at the base, deciduous or its base persistent on the achene. Achene triangular, lenticular or plano-convex. (Latin *scirpus*, bulrush.)

Stems terete or nearly so.

- Bristles barbed; umbels capitate or of a few short rays.....1. *S. acutus*.
- Bristles plumose; umbels long-rayed.....2. *S. californicus*.

Stems 3-angled.

Stems with a single head or compact umbel, leafy below or the leaves mainly basal; bristles 2 to 6.

Involucral bract solitary; spikelets densely capitate-clustered, the inflorescence apparently lateral; stems very slender, leafy below, scales awned-tipped.....3. *S. americanus*.

Involucral leaves several, foliaceous; inflorescence terminal, the spikelets capitate or in an umbel with unequal mostly short rays.....4. *S. campestris*.

Stems bearing a panicle of irregular umbels, leafy to the top; pedicels or raylets erect or spreading, bearing few to several sessile spikelets; bristles 4.....5. *S. microcarpus*.

1. **S. acutus** Muhl.
COMMON TULE. Fig. 10.
Stems arising from stout creeping rootstocks, terete or very obtusely trigonous above, 8.6 to 25.9 dm. high, leafless; inflorescence as if lateral, 2.4 to 12 cm. long; involucral bract stout, shorter than the inflorescence; spikelets 6 to 12 mm. long, numerous, congested-capitate, or in an irregular umbel with unequal rays; bristles 6, slender, retrorsely barbellate; style 2-cleft; achene lenticular.—Salt and freshwater marshes and borders of lakes and streams, very common.



Fig. 10. *Scirpus acutus* Muhl.; a, panicle of spikelets x 1; b, scale x 4; c, achene x 4; d, achene and bristles x 7.

It is our estimate that originally there were in California about 250,000 acres of tule lands; much of this area has now been reclaimed to cultivation. Tule stems were used by the native tribes to build their balsas or small boats and to weave mats. At the present day the stems are used for packing nursery stock for shipment, thatching hay-stacks, and as a source of potash.

2. **S. californicus** Britt. CALIFORNIA BULRUSH. Similar to no. 1; umbel irregular, looser, its rays more slender, up to 9.6 cm. long; spikelets dark reddish-brown, cylindric or narrow-ovate, (6 or) 8 to 10 mm. long; bristles 2, 3 or 4, ribbon-shaped, dark red, conspicuously short-hairy or somewhat plumose.—Marshes throughout Cal.

3. **S. americanus** Pers. THREE SQUARE. Stems 2.2 to 5.7 dm. high, very slender, triangular, somewhat leafy; leaves short, the blade 2.4 to 7.2 or 18 cm. long; involucre bract solitary, pungent, 2.4 to 9.6 cm. long; spikelets 1 to 6, oblong-ovate, 6 to 14 mm. long, borne in a single crowded sessile cluster; achene flat on one face, convex on the other.—Marshy often brackish places, occasional throughout Cal.

4. **S. campestris** Britt. BULL TULE. Stems 2.8 to 8.6 dm. high, stout, acutely triangular, the point of junction with the slender rootstock often enlarged into hard woody tubers; leaves equaling or exceeding the stem, keeled, flat or deeply channeled, 4 to 8 mm. wide; involucre of few unequal spreading foliaceous bracts 7.2 to 31 cm. long, one much the longer and more erect; inflorescence terminal, the spikelets in clusters of 1 to 3, the clusters congested-capitate or commonly somewhat umbellate with unequal rays; rays 6 to 36 mm. long; spikelets ovate or oblong-ovate, acute, 1.2 to 2 cm. long; achene round-obovate, sublenticular, dark brown, shining.—Salt marshes and moist alkaline soils.

5. **S. microcarpus** Presl. PANICLED BULRUSH. Stems from stout creeping rootstocks, stout, triangular, leafy, 5.7 to 14.4 dm. high; leaves flat, 8 to 16 mm. wide; margins scabrid; involucre of several spreading foliaceous bracts, about 1 to 2 times as long as the inflorescence; spikelets 1 to 5 in terminal and axillary clusters, the clusters in an umbellate compound panicle; panicle large and open; spikelets narrow-ovate, greenish or lead-colored, 2 to 5 mm. long; bristles 4, barbed to the base; achene plano-convex.—Common along streams and in fresh-water marshes.

3. CAREX L. SEDGE

Grass-like sedges, perennial by rootstocks. Stems mostly triangular. Leaves 3-ranked, the upper (bracts) elongate or short, and subtending the spikes of flowers or wanting. Flowers monoecious or sometimes dioecious. Spikes 1 to many, either wholly pistillate, wholly staminate or bisexual, sessile or peduncled. Perianth none. Stamens 3 (or rarely 2). Achene 3-angled, lenticular or plano-convex, completely enclosed by the sac-like perigynium. (The Latin name.)—The species in California number 126. They are too difficult for the beginner. (See Jepson, Flora of California, or Mackenzie, Monograph of the Genus Carex in California).

GRAMINEAE. GRASS FAMILY*

Herbs, commonly with hollow stems closed at the nodes. Leaves parallel-veined, consisting of the sheath and the linear blade, with a membranous appendage (the ligule) at the summit of the sheath. Flowers

*By A. S. HITCHCOCK and AGNES CHASE, United States Bureau of Plant Industry; very much abbreviated and condensed from their account in Jepson's Manual, with additions of the common crop plants and economic notes by W. L. Jepson.

minute, usually perfect, arranged in spikelets consisting of a shortened axis (rachilla) bearing bracts, the lowest pair of bracts (glumes) empty, each succeeding bract (lemma) including a single flower and a 2-nerved bract (palea), the flower, lemma and palea together termed the floret. Spikelets arranged in panicles, racemes or spikes. Perianth none or represented by minute scales or lodicules. Stamens usually 3. Pistil 1, superior. Ovary 1-celled, 1-ovuled; styles and plumose stigmas 2. Fruit a grain enclosed in the lemma and palea.

See figs. 11 and 12. Figure 11 shows a diagram of a grass spikelet. Figure 12 illustrates Wild Oat, *Avena fatua* L., showing a panicle of flowers (a); a spikelet (b) and a flower (h). The spikelet consists of a lower or first glume (c) and upper or second glume (d) with 3 florets, each one of the florets showing its lemma (as at e) bearing an awn (as at f). The rachilla of the spikelet ends in a sterile point (g). The figure at (h) shows a single floret with the lemma removed, exposing the flower backed by its palea (i). Two lodicules (j) appear at base of the flower, which bears 3 stamens (k) and one ovary (l) with two stigmas (m).

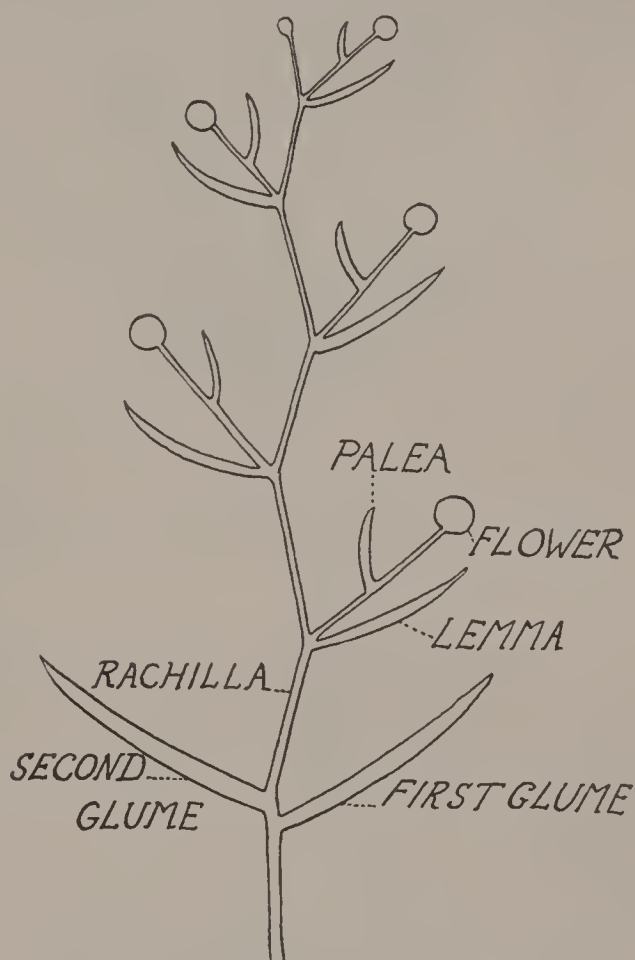


Fig. 11. Diagram of grass-spikelet.

The Grass Family, consisting of 5000 species, is the fourth largest family of seed plants. It is widely distributed in all parts of the earth from tropical savannahs, temperate plains and desert steppes to the arctic zones, and reaches in mountains the limits of phaenogamic vegetation. While not so rich in species as either Orchidaceae, Compositae or Leguminosae, the Grass Family far surpasses these and all other families in point of number of individuals, as well as in economic importance.

Probably the grain of wild wheat was the first grass to be gathered for food by some wandering tribe of Mesopotamia or Palestine in prehistoric times. Its gathering from wild plants or from plants the result of accidental sowing, led to its regular cultivation, the most important discovery, after the discovery of fire, made by the earliest of our primitive ancestors. Wheat, in particular, furnishes a food which can be stored for long periods without deterioration and which contains all the ingredients necessary to maintain life indefinitely. The finding of wheat was a most important step in the emergence of man from a savage state; its use opened the way to the development of a settled life, to husbandry and the arts of civilization. (Cf. "A Grain of Wheat," Pop. Science, Mo. 82:33-45.)

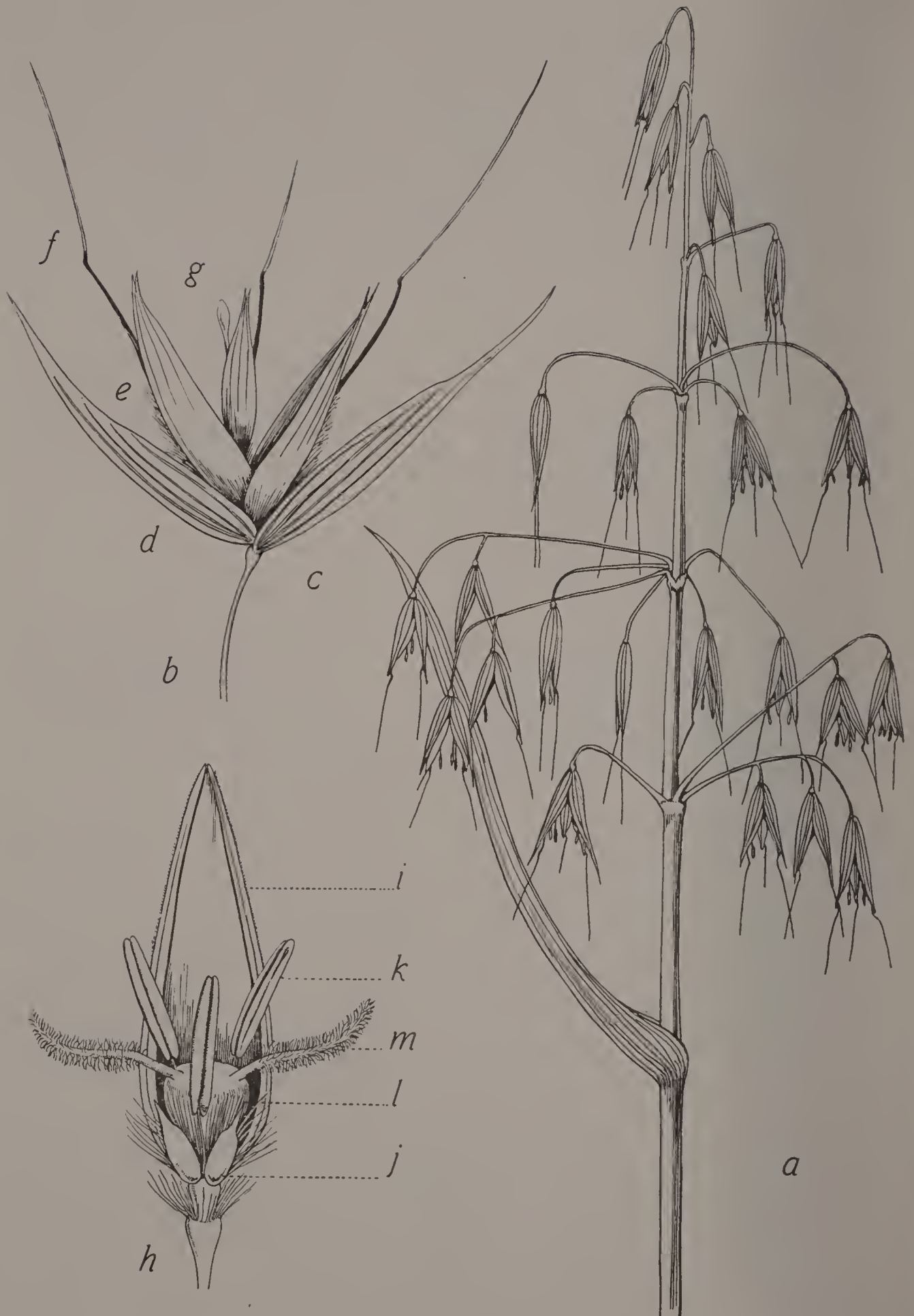


Fig. 12. *Avena Fatua* L. Wild Oat. See p. 187 and p. 201.

Some of the most famous plants in the family, in addition to those described in the following pages are: Bamboo (*Bambusa vulgaris* Wendl.), becoming in China and Japan a timber tree; Sugar Cane (*Saccharum officinarum* L.), which is sugar-producing; Esparto (*Stipa tenacissima* L. and *Lygeum spartum* L.), used in paper-making; Galleta (*Hilaria rigida* Benth.), a remarkable forage plant of the Mohave Desert; and Sleepy Grass (*Stipa vaseyi* Scribn.) of New Mexico, which has narcotic qualities.

SUBFAMILY 1. Poatae

Spikelets 1 to many-flowered, the reduced florets, if any, above the perfect florets (except in Phalarideae): articulation usually above the glumes; spikelets usually more or less laterally compressed.

Spikelets without sterile lemmas below the perfect floret (or these rarely present and like the fertile ones).

SPIKELETS pedicellate in open or contracted, sometimes spike-like panicles.
Spikelets 2 to many-flowered.

Glumes shorter than the first floret (except in *Dissanthelium* with long rachilla joints); lemmas awnless or awned from the tip or from a bifid apex.—FESTUCEAE (Fescue Tribe).

Tall stout reeds (3 to 6 m. high), with large plume-like panicles; spikelets several-flowered.

Lemmas hairy; rachilla naked.....7. ARUNDO.
Lemmas naked; rachilla hairy.....8. PHRAGMITES.

Low or rather tall grasses (1 dm. to 1.5 dm. high).

Plants dioecious, erect from creeping rhizomes, perennial; spikelets in a narrow simple exerted panicle.....
6. DISTICHLIS.

Plants not dioecious.

Spikelets of 2 forms, sterile and fertile intermixed; panicle dense, somewhat one-sided.....
10. LAMARCKIA.

Spikelets all alike in the same inflorescence.

Lemmas strongly 3-nerved, longer than the glumes..
5. ERAGROSTIS.

Lemmas 5 to many-nerved, the nerves sometimes obscure.

Lemmas as broad as long, the margins outspread; florets closely imbricate, horizontally spreading.....4. BRIZA.

Lemmas longer than broad, the margins clasping the palea; florets not horizontally spreading.

Glumes not papery.

Spikelets strongly compressed, crowded in 1-sided clusters at the ends of the stiff naked panicle branches.....9. DACTYLIS.

Spikelets not strongly compressed, not crowded in 1-sided clusters.

Lemmas minutely bifid at apex, with an awn in the notch or rarely awnless, convex or keeled on the back; spikelets large.....
1. BROMUS.

Lemmas not notched at apex (or very rarely).

- Lemmas somewhat keeled,
awnless; spikelets small.....3. *POA*.
- Lemmas rounded on the back,
awned; spikelets
medium
2. *FESTUCA*.
- Glumes papery; lemmas firm, strongly
nerved, scarious-margined; upper
florets sterile, often reduced to a
club-shaped rudiment enfolded
by the broad upper lemmas;
spikelets tawny or purplish,
usually not green.....11. *MELICA*.
- Glumes as long as the lowest floret, usually as long as the spikelet;
spikelets large, the glumes over 1 cm. long; lemmas awned
from the back.—*AVENEAE* (Oat Tribe).....19. *AVENA*.
- Spikelets* 1-flowered—*AGROSTIDEAE* (Timothy Tribe).
- Rachilla articulate above the glumes, these persistent after the fall
of the florets.
- Awns straight or none.
- Glumes not compressed-carinate, not ciliate.
- Panicle dense, spike-like; lemma and palea chartaceous;
florets bearing a tuft of hairs at base from the
callus.....20. *AMMOPHILA*.
- Panicle open or contracted; lemma and palea not chartaceous;
florets without hairs at base or with
short hairs.....21. *AGROSTIS*.
- Glumes compressed-carinate, abruptly mucronate, stiffly ciliate
on the keels; panicle dense, cylindric or ellipsoid.....22. *PHLEUM*.
- Awns twisted and bent, several to many times longer than the
slender fruit.....23. *STIPA*.
- Rachilla articulate below the glumes, the spikelets falling entire;
panicle contracted or spike-like; glumes long-awned.....
24. *POLYPOGON*.
- SPIKELETS** sessile on a usually continuous rachis (short-pedicellate in *Leptochloa*;
the rachis disarticulating in *Hordeum*, *Sitanion*, and a few
species of allied genera).
- Spikelets on opposite sides of the rachis; spike terminal, single.—*Hordeae*
(Barley Tribe).
- Spikelets solitary at each node of the rachis (rarely 2 in species of
Agropyron but never throughout the spike), 2 to several
flowered.
- Spikelets placed edgewise to the rachis; first glume wanting except
in the terminal spikelet.....12. *LOLIUM*.
- Spikelets placed flatwise to the rachis; glumes in pairs.
- Plants perennial.....13. *AGROPYRON*.
- Plants annual.
- Glumes ovate, 3-nerved.....14. *TRITICUM*.
- Glumes subulate, 1-nerved.....15. *SECALE*.
- Spikelets more than one at each node of the rachis.
- Spikelets 3 at each node of the rachis, 1-flowered, the lateral
pair pediceled, usually reduced to awns.....
16. *HORDEUM*.
- Spikelets 2 at each node of the rachis, alike, 2 to 6-flowered.
- Rachis continuous; glumes broad or narrow, entire.....
17. *ELYMUS*.
- Rachis disarticulating at maturity; glumes subulate, extending
into long awns, these and the awns of the
lemma making the spike very bristly.....
18. *SITANION*.

- Spikelets on one side of the rachis; spikes usually more than 1, digitate or racemose.—CHLORIDEAE (Gramma Tribe).
 Spikes digitate; rachilla articulate above the glumes....25. CYNODON.
 Spikes racemose, erect or nearly so; rachilla articulate below the glumes, the spikelets falling entire.....26. SPARTINA.
 Spikelets with 2 staminate, neuter, or rudimentary lemmas unlike and below the fertile lemma; no sterile or rudimentary florets above.—PHALARIDEAE (Canary Grass Tribe).....27. PHALARIS.

SUBFAMILY 2. *Panicatae*

Spikelets with one perfect terminal floret (disregarding those of the few monoecious genera and the staminate and neuter spikelets) and a sterile or staminate floret below, usually represented by a sterile lemma only, one glume sometimes (rarely both glumes) wanting; articulation below the spikelets, either in the pedicel, in the rachis, or at the base of a cluster of spikelets, the spikelets falling entire, singly, in groups, or together with joints of the rachis.

Spikelets strongly laterally compressed; stamens 6.—Tribe ORYZAE (Rice Tribe)
 28. ORYZA.

Spikelets more or less dorsally compressed; stamens 3.

Spikelets all alike; glumes and sterile lemma membranaceous, fertile lemma and palea indurate.—PANICEAE (Millet Tribe).

Spikelets pedicellate in open panicles; no ring-like callus at base of the spikelet.....29. PANICUM.

Spikelets sessile in slender racemes; racemes paired or racemose; first glume and the rachilla-joint forming a swollen ring-like callus at the base of the spikelet.....30. ECHINOCHLOA.

Spikelets in pairs, one sessile and perfect, the other pedicellate and staminate or neuter (the pedicellate one sometimes obsolete, rarely both pedicellate); glumes firm, lemmas hyaline.—ANDROPOGONEAE (Sorghum Tribe).

Inflorescences of one kind; flowers polygamous, in panicles....31. HOLCUS.

Inflorescences unisexual, of two kinds, the staminate flowers in a terminal panicle, the pistillate flowers in a spike, borne in the leaf axils.....32. ZEA.

1. *BROMUS* L. BROME GRASS

Plants with closed sheaths, flat blades, and open or contracted panicles of large spikelets. Spikelets several to many-flowered. Glumes unequal, acute, the first 1 to 3-nerved, the second usually 3 to 5-nerved. Lemmas convex or keeled, 5 to 9-nerved, 2-toothed at the apex, awnless or usually awned from between the teeth. Palea usually shorter than the lemma. (Ancient Greek name for the oat.)

Plants annual; introduced weeds.

Lemmas narrow, gradually acuminate, the awn as long as the body of the lemma or longer.

Panicle drooping; pedicels capillary.....1. *B. tectorum*.

Panicle erect; pedicels stiff.

Panicle compact; pedicels mostly less than 5 mm. long; culms pubescent at summit.....2. *B. rubens*.

Panicle relatively loose, some of the pedicels at least 10 mm. long; culms glabrous.....3. *B. madritensis*.

Lemmas broad, abruptly narrowed above, the awn mostly shorter than the body.....4. *B. rigidus*.

Panicle contracted, usually dense, erect or nearly so; lemmas pubescent; sheaths velvety.....5. *B. hordeaceus*.

Panicle loose, nodding or drooping.

Sheaths and lemmas glabrous; margin of lemma inrolled toward the base at maturity, the rachilla partly visible....6. *B. secalinus*.

Sheaths pubescent; margins of lemmas not inrolled or rarely.

Panicles nodding, the branches and pedicels not elongated and flexuous; awn usually not over $\frac{2}{3}$ as long as the broad glabrous or scaberulous lemma.....7. *B. commutatus*.

Panicles drooping, the branches and pedicels flexuous; awns mostly as long as the body of the narrower lemma or longer.....8. *B. arenarius*.

Plants perennial; panicle open, the branches spreading or drooping.

Spikelets strongly flattened, the lemmas strongly keeled toward the summit; spikelets awned; blades flat, glabrous or somewhat pilose.

Awn less than 7 mm. long; blades rather broad.....9. *B. marginatus*.

Awn more than 7 mm. long; blades usually narrow.....10. *B. carinatus*.

Spikelets not strongly flattened, the lemmas not keeled; first glume 1-nerved; lemmas sparsely pubescent on back, ciliate on margins or nearly glabrous.....11. *B. vulgaris*.

1. ***B. tectorum*** L. DOWNY BROME. Culms tufted, 3 to 6.5 dm. high, the whole plant softly pubescent; panicle many-flowered, loose, drooping, commonly $\frac{1}{2}$ the entire height of the plant; spikelets 1.5 to 2 cm. long, nodding; lemmas pubescent; awn 1.2 to 1.5 cm. long.—Waste places; nat. from Mediterranean region. Var. **NUDUS** Klett & Richt. Spikelets glabrous.—The common form in Cal.

2. ***B. rubens*** I. RED BROME. Culms 1.5 to 3.8 dm. high, puberulent below the panicle; sheaths and blades pubescent; panicle erect, compact, ovoid, usually purplish, 4 to 8 cm. long; spikelets 7 to 11-flowered, about 2 cm. long; lemmas 5-nerved, pubescent or smooth, 1.2 to 1.5 cm. long, the apex deeply cleft into 2 long-acuminate hyaline teeth; awn about 2 cm. long.—Dry hills and in waste or cultivated ground; common especially in middle and S. Cal.; nat. from s. Eur.

3. ***B. madritensis*** L. Culms tufted, 3 to 6 dm. high; sheaths smooth or the lower slightly pubescent; blades puberulent or nearly smooth; panicle erect, 4 to 8 cm. long, oblong-ovoid in outline, contracted, rather dense; lemmas 1.5 to 1.8 cm. long, usually glabrous or scabrous only, somewhat curved outward when old, distinctly 3 or faintly 5 to 7-nerved, with 2 acute hyaline teeth; awn rather stout, tapering, somewhat curved, 1.6 to 2.2 cm. long.—Open ground and waste places; nat. from Eur.

4. ***B. rigidus*** Roth. "RIPGUT" GRASS. Culms 4.5 to 7.5 dm. high; sheaths and blades pilose; panicle open, rather few-flowered, 6 to 10 cm. long; spikelets usually 5 to 7-flowered, 3.5 to 5 cm. long; lemmas 5-nerved, scabrous or puberulent, 2-toothed; awn stout, 3.5 to 5 cm. long.—Weed in open ground and waste places, nat. from Mediterranean region. Var. **GUSSONEI** (Parl.) Coss. & Dur. Differs in having a more open panicle, and longer flexuous branches and pedicels, the lower branches as much as 10 to 12 cm. long.—More common than the species in mid. and n. Cal.; nat. from s. Eur. At maturity nos. 2 to 4 are injurious to grazing animals; the disjointed sharp-pointed florets with their long rough awns penetrate the eyes, nose and mouth parts, causing sores and blindness.

5. ***B. hordeaceus*** L. SOFT CHEAT. Culms 2 to 7.5 dm. high; sheaths retrorsely softly pilose; blades usually pubescent; panicle contracted, erect, 5 to 10 cm. long, or in depauperate plants reduced to a few spikelets;

glumes broad, obtuse, coarsely pilose or scabrous-pubescent, the first 3 to 5-nerved, the second 5 to 7-nerved; lemmas obtuse, 7-nerved, coarsely pilose or scabrous-pubescent, rather deeply bidentate, 8 to 9 mm. long, the margin and apex hyaline; awn rather stout, 6 to 9 mm. long.—Weed in open hillsides, waste places and cultivated soil, abundant; nat. from Eur. This aggressive alien is typical of the immigrant bromes. Within the last forty years it has crowded valuable native plants off the ranges. Though cattle eat it green, they will not touch it when it is dry.

6. **B. secalinus** L. CHEAT. CHESS. Culms erect, 3 to 6 dm. high; sheaths smooth; panicle pyramidal, drooping, 8 to 15 cm. long, open, the lower branches 3 to 5, unequal; spikelets ovoid-lanceolate, becoming somewhat turgid in fruit, 1.2 to 1.5 cm. long; glumes obtuse, the first 3 to 5-nerved, the second 7-nerved; lemmas 7-nerved, 6 to 8 mm. long, elliptic, obtuse, smooth or scabrous, the margin strongly involute in fruit, apex shortly bidentate, the undulate awn usually 3 to 6 mm. long. In fruit the turgid florets are somewhat distant so that, viewing the spikelet sidewise, the light passes through the small openings at the base of each floret.—Weed in grain fields and waste places; nat. from Eur.

7. **B. commutatus** Schrad. Resembling no. 6; sheaths retrorsely pubescent; blades commonly pubescent; lemmas with an obtuse angle on the margin just above the middle, the margin not as strongly inrolled in fruit as in no. 6, the awn straight and rather longer than in no. 6.—Weed in fields and waste places; nat. from Eur.

8. **B. arenarius** Labill. Culms 1.5 to 4.5 dm. high; sheaths and blades pilose; panicle pyramidal, open, the spreading branches and slender pedicels sinuously curved; spikelets 1.5 to 1.8 cm. long, densely pilose; glumes acute, scarious-margined, the first narrower, 3-nerved, the second 7-nerved; lemmas 7-nerved, 2-toothed; awn 1 to 1.5 cm. long.—Sandy roadsides, gravelly or sterile hills; cent. to S. Cal.; nat. from Austr.

9. **B. marginatus** Nees. Short-lived perennial; culms rather stout, 6 to 12 dm. high; sheaths pilose; blades broad, flat, more or less pilose; panicle erect, rather narrow, 10 to 20 cm. long, the lower branches somewhat spreading; spikelets 7 or 8-flowered, 2.5 to 3.5 cm. long; glumes broad, scabrous, or scabrous-pubescent, the first subacute, 3 to 5-nerved, the second obtuse, 5 to 7-nerved; lemmas subcoriaceous, coarsely pubescent, ovate-lanceolate, acute, 12 to 14 mm. long; awn 4 to 7 mm. long.—Open ground, open woods, roadsides and waste places.

10. **B. carinatus** H. & A. CALIFORNIA BROME GRASS. Culms 6 to 9 dm. high; sheaths pilose; blades narrow, flat, more or less pilose; panicle pyramidal, rather lax, the lower branches spreading or drooping; spikelets about 2.5 cm. long, 6 mm. wide, 5 to 9-flowered; glumes lanceolate, acute, glabrous or slightly scabrous-pubescent, the first 3-nerved, the second 5-nerved; lemmas lanceolate, puberulent or short-pubescent, 12 to 16 mm. long; awn 7 to 10 mm. long.—Open ground, open woods, roadsides and waste places, throughout the state. Var. CALIFORNICUS Shear. Sheaths smooth; spikelets narrower than in the species.—Common in the Coast Ranges; infrequent in the Sierra Nevada and San Bernardino Mts. Var. HOOKERIANUS Shear. Sheaths smooth; spikelets as broad as in the

species.—Range about as in the last, less common. Var. *LINEARIS* Shear. Sheaths pubescent; blades less than 2 mm. wide; panicle narrow, few-flowered.—Berkeley Hills; Mt. Lyell, above timber-line.

11. *B. vulgaris* (Hook.) Shear. Culms 9 to 12 dm. high; nodes pubescent; sheaths pilose; blades scattered, more or less pilose; panicle open, 10 to 18 cm. long, the branches slender, drooping; spikelets slender, about 2.5 cm. long; glumes narrow, sparsely pubescent, the first 1-nerved, acute, the second 3-nerved, broader and longer than the first, obtuse or acutish; lemmas 8 to 10 mm. long, sparsely pubescent over back, pubescent or ciliate near the margins or nearly glabrous; awn 6 to 8 mm. long.—Rocky woods and shady ravines, 100 to 7000 ft.

2. *FESTUCA* L. FESCUE

Annuals or perennials. Spikelets few to several-flowered. Glumes narrow, acute, unequal, the first sometimes very small. Lemmas rounded on the back, membranaceous or somewhat indurate, 5-nerved, the nerves often obscure, acute or rarely obtuse, awned from the tip or rarely from a minutely bifid apex. (Ancient name for some grass.)

Plants annual; branches of the narrow panicle erect or appressed; spikelets loosely 1 to 5-flowered; florets narrowly lanceolate; first glume 1-nerved, not more than $\frac{1}{2}$ as long as the second 3-nerved glume; stamen usually 1; lemmas with narrow scarious margin.

Lemma ciliate.....1. *F. megalura*.

Lemma not ciliate.....2. *F. myuros*.

Plants perennial; blades usually folded or involute, narrow or capillary; throat of sheath (collar) and auricles of blade tomentose or bristly.....3. *F. californica*.

1. *F. megalura* Nutt. Culms 2 to 6 dm. high; sheaths and blades smooth; panicle narrow, somewhat 1-sided, 8 to 20 cm. long; spikelets 4 or 5-flowered; glumes glabrous, the first about half the length of the second; lemmas scabrous above, attenuate into an awn about twice its length.—Cultivated or open ground, sandy soil, and waste places. The cilia on the lemmas are sometimes hidden at maturity by the incurved edges.

2. *F. myuros* L. RAT'S-TAIL FESCUE. Similar to no. 1 but lemmas not ciliate.—Waste grounds; nat. from Eur.

3. *F. californica* Vasey. CALIFORNIA FESCUE. Culms tufted, stout, coarse, usually 9 to 15 dm. high, scabrous; sheaths somewhat scabrous, the collar and auricles pilose; blades flat or becoming involute, hard, firm, scabrous, the lower elongate; panicle large, usually loose and open, the few long slender branches naked below, bearing a few spikelets toward the ends; spikelets compressed, about 5-flowered, 10 to 18 mm. long; glumes oblong-lanceolate, firm, smooth, except the scabrous keel; lemmas 8 to 10 mm. long, lanceolate, firm, scabrous, acuminate or short-awned.—Meadows, shady banks and wood borders; Coast Ranges from Monterey Co. to Siskiyou Co. Var. *PARISHII* (Piper) Hitchc. Plant more slender; culms about 4.5 to 6 dm. tall; sheaths puberulent; blades 1.5 to 2.5 dm. long, closely involute, smooth below or nearly so; panicle 10 to 12 cm. long; awn 3 to 4 mm. long.—San Bernardino Mts.

3. *POA* L. BLUE GRASS

Plants with open or contracted panicles, and narrow blades with boat-

shaped tips. Spikelets 2 to several-flowered, the uppermost floret reduced or rudimentary. Glumes acute, keeled, somewhat unequal, the first 1-nerved, the second usually 3-nerved. Lemmas somewhat keeled, acute or acutish, awnless, membranous, often somewhat scarious at the tip, 5-nerved. (Greek poa, grass or fodder.)

Annual; lemmas not cottony at base, 5-nerved, the nerves pilose on lower half.....
1. *P. annua*.

Perennial.

Plants sod-forming, with creeping rhizomes; lemmas copiously cottony at base.....2. *P. pratensis*.

Plants in bunches, without creeping rhizomes; lemmas not cottony at base.....
3. *P. scabrella*.

1. *P. annua* L. In tufts or mats; culms flattened, 0.8 to 2 dm. long, decumbent at base, sometimes rooting at the lower nodes; blades soft; panicle 2.5 to 7 cm. long; spikelets crowded, 3 to 6-flowered, 3 to 4 mm. long.—Open ground, along roadsides and in waste places; nat. from Eur.

2. *P. pratensis* L. KENTUCKY BLUE GRASS. Culms tufted, 3 to 9 dm. high, terete or slightly flattened; sheaths smooth, compressed; ligule about 2 mm. long; blades soft, flat or folded, the basal often elongate; panicle pyramidal, open, the slender branches in remote fascicles of 3 to 5, ascending or spreading, naked at base, some of them short; spikelets crowded, 3 to 5-flowered, 4 to 5 mm. long; lemmas 3 mm. long, copiously cottony at base, silky villous on keel and marginal nerves, the intermediate nerves prominent.—Open woods or open ground; extensively cult. as a pasture and lawn grass.

3. *P. scabrella* (Thurb.) Benth. MALPAIS BLUE GRASS. Densely tufted; culms erect, 6 to 9 dm. high, usually scabrous, at least below panicle; sheaths scabrous; ligule 3 to 5 mm. long; blades mostly basal, flat, narrow, usually about 1 mm. wide, lax, more or less scabrous; panicle narrow, usually contracted, sometimes rather open at base, 5 to 12 cm. long; spikelets narrow, 6 to 10 mm. long; glumes scabrous; lemmas 4 mm. long, puberulent or scabrous on back, and more or less crisp-pubescent on lower half.—Meadows, woods, rocks and hills, common.

4. *BRIZA* L. QUAKING GRASS

Ours low annuals with erect culms, flat blades, and open showy panicles, the pedicels capillary, the spikelets vibrating in the wind. Spikelets several-flowered, broad, often cordate, the florets crowded and spreading horizontally, the uppermost floret reduced. Glumes about equal, broad, papery-chartaceous, with scarious margins. Lemmas papery, broad, with scarious spreading margins, cordate at base. Palea much shorter than the lemma. (Ancient Greek name for some grain, probably rye.)

1. *B. minor* L. Culms 1 to 3.8 dm. high; panicle pyramidal; spikelets triangular-ovate, 3 mm. long.—Waste places, cent. Cal.; nat. from Eur.

5. *ERAGROSTIS* Host

Spikelets few to many-flowered, the florets usually closely imbricate, the lemmas often deciduous, the paleas persistent. Glumes somewhat unequal, shorter than the first lemma, acute or acuminate, 1-nerved, or the second rarely 3-nerved. Lemmas acute or acuminate, keeled or rounded

on the back, 3-nerved, the nerves usually prominent. (Eros, love, agrostis, grass, from the common European name, "love-grass.")

1. **E. cilianensis** (All.) Link. STINK GRASS. SNAKE GRASS. Annual; culms erect or ascending from a decumbent base, rather flaccid, freely branching, 2 to 6 dm. high; panicles greenish-lead-color, 1.3 to 3.8 dm. long, rather densely flowered; spikelets 6 to 12 mm. long, 10 to 40-flowered, the florets closely imbricate; lemmas thin, the lateral nerves prominent.—Fields, roadsides and waste places; nat. from Eur. Strong-scented when fresh.

6. **DISTICHLIS** Raf.

Low dioecious perennial with extensively creeping rhizomes, erect rigid culms and short dense rather few-flowered panicles. Spikelets several to many-flowered. Glumes unequal, broad, acute, keeled, mostly 3-nerved, the lateral nerves sometimes faint or obscured by striations and intermediate nerves. Lemmas closely imbricate, firm, the pistillate coriaceous, the margins bowed out near the base, acute or acutish, 3-nerved, with several intermediate nerves or striations. Palea as long as the lemma or shorter, the pistillate coriaceous, inclosing the grain. (Greek distichos, 2-ranked.)

1. **D. spicata** (L.) Greene. SALT GRASS. Forming tough sod, glaucous; culms 1 to 6 dm. high; leaves numerous, stiff, often conspicuously distichous.—Salt marshes and alkaline soil at low altitudes, common.

7. **ARUNDO** L.

Tall perennial reeds with broad linear blades and large plume-like terminal panicles. Spikelets several-flowered, the florets successively smaller, the summits of all about equal, the rachilla glabrous. Glumes somewhat unequal, membranous, 3-nerved, narrow, tapering into a slender point, about as long as the spikelet. Lemmas thin, 3-nerved, densely long-pilose, gradually narrowed at the summit, the nerves ending in slender teeth, the middle one extending into a straight awn. (Ancient Latin name for reed.)

1. **A. donax** L. GIANT REED. Culms stout, 2 to 6 m. high, from knotty branching rhizomes; blades 4 to 8 cm. wide on the main culm, the base cordate, more or less hairy-tufted.—Native of the Orient; escaped along irrigating ditches in cent. and S. Cal.

8. **PHRAGMITES** Adans.

Tall perennials with broad blades. Glumes 3-nerved, or the upper 5-nerved, lanceolate, the first about half as long as the upper. Lemmas narrow, long-acuminate, 3-nerved. (Greek phragmites, growing in hedges.)

1. **P. communis** L. COMMON REED. Culms robust, 1.7 to 3.5 dm. high; spikelets about 12 mm. long.—Freshwater swamps, marshes and springs.

9. **DACTYLIS** L.

Perennials with flat blades and fascicled spikelets. Spikelets few-flowered, compressed, nearly sessile in dense one-sided fascicles, these borne at the ends of the few branches of a panicle. Glumes unequal, carinate, acute, hispid-ciliate on the keel. Lemmas compressed-keeled, mucronate, 5-nerved, ciliate on the keel. (Greek, daktulos, a finger.)

1. **D. glomerata** L. ORCHARD GRASS. Culms in large tussocks, erect, 6 to 12 dm. high; blades broadly linear; panicle 8 to 20 cm. long, the few stiff branches naked below, contracted after flowering; spikelets 5 to 8 mm. long.—Cult.; escaped along roadsides and in waste places; native of Eur.

10. LAMARCKIA Moench

Annual with flat blades and oblong one-sided compact panicles, the crowded fascicles drooping, falling entire, the fertile spikelets hidden, except the awns, by the sterile ones. Spikelets of two kinds, in fascicles, the terminal one of each fascicle fertile, the others sterile. Fertile spikelet with 1 perfect floret, the rachilla produced beyond the floret, bearing a small awned empty lemma or reduced to an awn; glumes narrow, acuminate or short-awned, 1-nerved; lemma broader, raised on a slender stipe, scarcely nerved, bearing just below the apex a delicate straight awn. Sterile spikelets linear, 1 to 3 in each fascicle, consisting of 2 glumes similar to those of the fertile spikelet, and numerous distichously imbricate obtuse awnless empty lemmas. (Jean Baptiste Antoine Pierre Monnet, Chevalier de La Marck, eminent French naturalist.)

1. **L. aurea** Moench. GOLDEN-TOP. Culms erect, 1 to 3.8 dm. high, ligule prominent, decurrent as a broad scarious margin; panicle shining, golden-yellow or purplish; fertile spikelet about 2 mm. long, the sterile 4 to 8 mm. long.—Cult. and waste ground, common in S. Cal., rarer northw; nat. from Mediterranean region.

11. MELICA L.

Rather tall perennials, the base of the culm often swollen into a corm, with closed sheaths and usually flat blades. Panicle narrow or sometimes open, usually simple, of relatively large spikelets. Spikelets 2 to several-flowered, the rachilla prolonged beyond the perfect florets and bearing at the apex two or three gradually smaller empty lemmas, convolute together or the upper inclosed in the lower. Glumes somewhat unequal, thin, scarious-margined, obtuse or acute, sometimes nearly as long as the lower floret, 3 to 5-nerved, the nerves usually prominent. Lemmas convex, several-nerved, membranous or rather firm, awnless or sometimes awned from between the teeth of the bifid apex. (Old Italian name for sorghum, from mel, honey.)

1. **M. imperfecta** Trin. Culms erect, 3 to 9 dm. high; blades narrow, usually not over 2 mm. wide; panicle 1 to 3 dm. long, the unequal branches more or less fascicled.—Dry open woods and rocky hillsides, lower altitudes, frequent in cismontane Cal.

12. LOLIUM L. RYE GRASS

Plants with flat blades and simple terminal flat spikes. Spikelets several-flowered, solitary, placed edgewise to the continuous rachis, one edge fitting to the alternate concavities. First glume (next to rachis) wanting (except on the terminal spikelet), the second glume outside, strongly 3 to 5-nerved, equaling or exceeding the second floret. Lemmas rounded on the back, 5 to 7-nerved, obtuse, acute, or awned. (Ancient Latin name.)

Glume shorter than the spikelet; perennial.

Lemmas awned.....1. *L. multiflorum*.

Lemmas nearly or quite awnless.....2. *L. perenne*.
 Glume as long or longer than the spikelet; annual.....3. *L. temulentum*.

1. ***L. multiflorum*** Lam. ITALIAN OR AUSTRALIAN RYE GRASS. Culms 3 to 6 dm. high, erect or often decumbent at base, often rough below the spike and on the convex side of the rachis; spike nodding, as much as 30 cm. long; spikelets 1.5 to 2.5 cm. long, much exceeding the glume, 10 to 20-flowered; lemmas 7 to 8 mm. long, the lower short-awned or awnless.—Roadsides and waste places, common; introd. from Eur. Frequently cult. for lawns and as meadow or pasture grass.

2. ***L. perenne*** L. PERENNIAL OR ENGLISH RYE GRASS. Resembling no. 1, but usually more slender, with narrower glossy blades and smaller spikes; culms and convex side of rachis smooth; spikelets usually 8 to 10-flowered, not much exceeding the glume; lemmas smaller.—Roadsides and waste places, rare; introd. from Eur. Sometimes cult. as a lawn or pasture grass.

3. ***L. temulentum*** L. DARNEL. CHEAT. Culms 6 to 9 dm. high; spikes stout, strict, 12 to 20 cm. long; glume 1.5 to 2.5 cm. long, equaling the 5 to 7-flowered spikelet, firm, pointed, conspicuous; lemmas 6 to 8 mm. long, obtuse, awned; awn as much as 8 mm. long.—Fields and waste places, rather common; nat. from Eur. Var. *ARVENSE* Bab. Differs in having awnless spikelets.—Less common than the species; nat. from Eur.

13. **AGROPYRON** Gaertn. WHEAT GRASS

Our species perennial, often with creeping rhizomes. Spikelets several-flowered, solitary (or rarely in pairs), placed flatwise at each joint of a continuous (rarely disarticulating) rachis. Glumes equal, firm, several-nerved, usually shorter than the first lemma, acute or awned, rarely obtuse or notched. Lemmas convex, rather firm, 5 to 7-nerved, usually acute or awned from the apex. Palea shorter than the lemma. (Greek *agros*, field, and *puros*, wheat.)

1. ***A. tenerum*** Vasey. SLENDER WHEAT GRASS. Culms erect, tufted, 6 to 12 dm. high; spike cylindric, slender, erect, 10 to 15 cm. long; glumes nearly as long as the spikelet, gradually tapering into an awned point.—Open woods, rocky slopes and valley plains, widely scattered.

14. **TRITICUM** L.

Slender annuals. Flowers in a terminal spike. Spikes dense, somewhat 4-sided. Spikelets 2 to 5-flowered, borne singly on opposite sides of a zig-zag rachis. Glumes broadly ovate, obtuse, 3 to many-nerved, several-toothed or awned. Lemmas awned or awnless. Grain free. (Old Latin name for wheat.)

1. ***T. sativum*** L. WHEAT. A collective species grown in many varieties under many names. Aaronsohn considers the cultural form, *T. dicoccum* Schrank, to be the ancestor of true wheat and that it is derived from a wild wheat in Palestine, *T. dicoccoides* Korn. (cf. U. S. Bur. Pl. Ind. Bull. 180:36-52). Wheat has been cultivated from prehistoric times. When Joseph's brethren came down into Egypt, the house of bondage, out of the land of Canaan, to buy corn in the years of famine, this corn was wheat, and possibly barley or millet, but not our American corn which is maize and which was unknown in the Old World until after the discovery of America by Columbus. At one time,

in the period after gold days, our Californians were extensive producers of wheat. The grain ships for Liverpool made a forest of masts in San Francisco Bay and Carquinez Straits. Nowadays we do not produce sufficient wheat for our own mills.

15. SECALE L. RYE

Tall slender herbs. Spikes terminal, dense. Spikelets with 2 perfect flowers, sessile on the opposite sides of a zig-zag rachis. Glumes subulate, 1-nerved. Lemmas keeled, long-awned. (Said to be from Latin *seco*, to cut.)

1. **S. cereale** L. Native of Asia; cult. widely in the U. S., the grain used for making bread and for distilling gin. Tradition says gin produced most extraordinary effects of a highly exhilarating character upon the imbibor, succeeded by languor or stupor, in the case of extreme potations, sometimes ending in death.

16. HORDEUM L. WILD BARLEY

Plants with flat blades and dense terminal cylindrical spikes. Spikelets 1-flowered, 3 (sometimes 2) together at each node of the rachis, the middle one sessile or subsessile, the lateral ones pediceled, the back of the lemma turned from the rachis. Rachilla in the central spikelet prolonged behind the palea as a bristle and sometimes bearing a rudimentary floret; lateral spikelets usually imperfect, sometimes reduced to bristles. Glumes narrow, often subulate and awned, rigid, standing in front of the spikelet. Lemmas rounded on the back, 5-nerved, usually obscurely so, tapering into a usually long awn. (Ancient Latin name for barley.)

Rachis not disarticulating at maturity; plants annual.....1. *H. vulgare*.
Rachis disarticulating at maturity (that is, breaking up into joints).

Plants annual.

Glumes or some of them ciliate.....2. *H. murinum*.

Glumes not ciliate.....3. *H. gussoneanum*.

Plants perennial.....4. *H. nodosum*.

1. **H. vulgare** L. CULTIVATED BARLEY. Culms 5 to 15 dm. high; auricles of the blade prominent, glabrous; spike densely flowered, 7 to 9.5 cm. long, not including the long awns; lemma fusiform, narrowed into a scabrous flat awn 7 to 14 cm. long.—Native of the Old World; cult. extensively in Cal. The grain is used as food for horses and swine, and also for flour in bread-making. Var. **TRIFURCATUM** Wend. Beardless Barley. Awns suppressed, replaced by short lobes or teeth.—Cult.

2. **H. murinum** L. FARMER'S FOXTAIL. Culms bushy-branched, spreading; sheaths and blades smooth; spike 5 to 8 cm. long, often partly enclosed in the uppermost inflated sheath; glumes of the central spikelet narrowly spindle-form, 3-nerved, long-ciliate on both margins, the nerves scabrous; awn about 2.5 cm. long; glumes of the lateral spikelets unlike, the inner similar to the central, the outer setaceous, not ciliate; lemmas all broad, 8 to 10 mm. long, the awns somewhat exceeding those of the glumes.—Fields, waste places and open ground, very common and abundant; nat. from Eur.

3. **H. gussoneanum** Parl. Culms numerous, spreading or geniculate at base, 1.5 to 3.8 dm. high; sheaths and flat blades, especially the lower,

more or less pubescent; spike erect, oblong, 1.5 to 4 cm. long, about 10 mm. wide, rounded at base; glumes setaceous, about 1.5 cm. long; lemma of lateral spikelets reduced, the awn 2 to 3 mm. long; lemma of central spikelets 5 mm. long, the awn somewhat longer than the glumes.—Fields and waste places, common in cent. Cal., rare in S. Cal.; nat. from Eur.

4. **H. nodosum** L. MEADOW BARLEY. Culms tufted, erect or geniculate-ascending, 1.5 to 6 dm. high; blades relatively short and erect; spike slender, 2 to 8 cm. long; glumes all setaceous, 8 to 15 mm. long; floret of lateral spikelets much reduced.—Meadows and open ground throughout the state.

17. **ELYMUS** L. WILD RYE

Erect, usually rather tall, mostly perennials, with flat or rarely convolute blades and erect or nodding spikes. Spikelets usually crowded, 2 to 6-flowered, in pairs (rarely 3 or more or solitary) at each node of a continuous rachis, the florets dorsiventral to the rachis. Glumes equal, usually rigid, narrow, 1 to several-nerved, acute to aristate, somewhat asymmetric and often placed in front of the spikelets. Lemmas rounded on the back or nearly terete, obscurely 5-nerved, acute or usually awned from the tip. (Greek *elumos*, ancient name for a kind of millet.)

Glumes subulate or very narrow, glabrous; plants perennial, with rhizomes.

Blades 2 to 6 mm. wide.....1. *E. triticoides*.

Blades 1 to 2 cm. wide.....2. *E. condensatus*.

Glumes lanceolate, with 2 to 4 scabrous nerves; plants perennial, without rhizomes.

3. *E. glaucus*.

1. **E. triticoides** Buckl. Culms usually glaucous, 6 to 12 dm. high, commonly in large masses; rhizomes extensively creeping, the scales sometimes reddish; blades flat, or soon involute; spike 10 to 18 cm. long, slender, sometimes branched, 1 to 1.5 cm. long; lemmas 6 to 10 mm. long, glabrous, short-pointed, brownish.—Moist bottomland and alkaline soil throughout the state.

2. **E. condensatus** Presl. GIANT RYE GRASS. Culms in large clumps, stout, 9 to 18 dm. high, producing stout knotty rhizomes; blades flat; spike erect, usually dense, 15 to 30 cm. long, sometimes branched; spikelets 1.2 to 2 cm. long; glumes awn-pointed, usually 1-nerved, or nerveless, about as long as the first lemma; lemmas awnless or mucronate.—Dry plains and hillsides and along gullies and ditches: South Coast Ranges near the coast; S. Cal.

3. **E. glaucus** Buckl. WESTERN RYE GRASS. Culms erect, 6 to 12 dm. high; blades flat (rarely more or less involute), 5 to 10 mm. wide, scabrous on both surfaces; spike somewhat nodding, usually dense, long-exserted, 5 to 15 cm. long, rarely longer; spikelets 1 to 1.2 cm. long; glumes about as long as the spikelet; awn of lemma 1 to 2 times as long as the body.—Open woods, copses, and dry hillsides, throughout the state; n. to Alas., e. to Mich. and Mo. Var. **JEPSONII** Davy. Sheaths and blades more or less pubescent.—Dry woods and ravines, Napa Valley. The species is exceedingly variable.

18. **SITANION** Raf.

Cespitose perennials, with bristly spikes. Spikelets 2 to few-flowered, the uppermost floret reduced, usually 2 at each node of a disarticulating

rachis, the rachis breaking at the base of each joint, remaining attached as a pointed stipe to the spikelets above. Glumes narrow or setaceous, 1 to 3-nerved, the nerves prominent, extending into one to several awns, these (when more than one) irregular in size, sometimes mere lateral appendages of the long central awn, sometimes equal, the glume being bifid. Lemmas firm, nearly terete, the apex slightly 2-toothed, 5-nerved, the nerves obscure, the central nerve extending into a long slender finally spreading awn, sometimes one or more of the lateral nerves also extending into short awns. Palea firm, nearly as long as the body of the lemma. (Greek *sitos*, grain for food.)

1. **S. jubatum** J. G. Sm. Culms erect, 3 to 6 dm. high, rarely taller; spike erect, dense, 2.5 to 8 cm. long, thick and bushy from the numerous long awns.—Rocky or brushy hillsides and open dry woods and plains, widely scattered throughout cismontane Cal. Exceedingly variable in size, pubescence and length of awns.

19. AVENA L. OAT

Ours rather tall annuals. Panicles usually rather few-flowered, of usually large spikelets. Spikelets 2 to several-flowered, the rachilla bearded. Glumes about equal, membranous or papery, several-nerved, longer than the lower floret, usually exceeding the upper floret. Lemmas indurate, except toward the summit, 5 to 9-nerved, bidentate at the apex, bearing a dorsal bent and twisted awn (this straight and reduced in *A. sativa*). (The classical Latin name.)

Lemmas glabrous or nearly so.....	2. <i>A. sativa</i> .
Lemmas pubescent with long usually brown hairs.	
Teeth of lemmas acuminate, not awned.....	1. <i>A. fatua</i> .
Teeth of lemmas awned.....	3. <i>A. barbata</i> .

1. **A. fatua** L. WILD OAT. Fig. 12. Culms 3 to 9 dm. high, erect, stout; panicle loose and open, the slender branches usually horizontally spreading; spikelets usually 3-flowered; glumes about 2.5 cm. long; rachilla and lower part of the shining lemma clothed with long stiff brownish hairs; florets readily falling from the glumes; lemma nerved above, about 2 cm. long, awn stout, geniculate, red-brown, twisted below, about 4 cm. long.—Fields and waste places, common; nat. from Eur. Var. *GLABRATA* Peterm. Differs in having nearly or quite glabrous lemmas.—With the species; nat. from Eur.

2. **A. sativa** L. CULTIVATED OAT. Similar to no. 1; florets not readily separating from the glumes; spikelets usually 2-flowered; lemma glabrous; awn straight, often wanting.—Commonly cultivated and occasionally escaped; native of Eur. Oats, the food of horses in England, is in Scotland the common food of the people (consult Dr. Samuel Johnson). In California oats are used as food by both horses and men.

3. **A. barbata** Brot. Similar to no. 1; spikelets somewhat smaller, mostly 2-flowered, the pedicels curved and capillary; lemma clothed with stiff red hairs, the acuminate teeth ending in fine awns 4 mm. long.—Fields and waste places; nat. from Eur.

20. AMMOPHILA Host

A tough rather coarse erect perennial, with hard scaly creeping rhizomes, long tough involute blades, and a pale dense spike-like panicle.

Spikelets 1-flowered, compressed, the rachilla disarticulating above the glumes, produced beyond the palea as a short bristle, hairy above; glumes about equal, chartaceous; lemma similar to and slightly shorter than the glumes, the callus bearing a tuft of short hairs; palea nearly as long as the lemma. (Greek ammos, sand, and philein, to love.)

1. **A. arenaria** (L.) Link. BEACH GRASS. Culms stout, 6 to 9 dm. high; panicle 10 to 30 cm. long; spikelets 1 to 2 cm. long.—Introd. on the Pacific Coast where it has been used as a sandbinder on seacoast sand-dunes; native of Eur.

21. AGROSTIS L. BENT GRASS

Plants with glabrous culms and scabrous blades. Panicles of small spikelets. Rachilla disarticulating above the glumes, usually not prolonged. Glumes equal or nearly so, acute, acuminate, or sometimes awn-pointed, carinate. Lemma obtuse, usually shorter and thinner in texture than the glumes, awnless or dorsally awned, often hairy on the callus. Palea usually shorter than the lemma, 2-nerved in only a few species, usually small and nerveless or obsolete. (Ancient Greek name of a forage grass, from agros, a field.)

Palea evident, 2-nerved, $\frac{1}{2}$ to as long as lemma; plants with rhizomes.....

1. *A. palustris*.

Palea minute, nerveless; plants without rhizomes or with very short ones.....

2. *A. exarata*.

1. **A. palustris** Huds. REDTOP. Culms erect or decumbent and rooting at base, 3 to 9 dm. high; panicle pyramidal, loose but not diffuse, 5 to 30 cm. long, the lower branches in whorls; lemma a little shorter than the glumes, obtuse, rarely awned on back.—Cult. as a meadow grass, frequently escaped along roadsides and in waste places; introd. from Eur. (*A. alba* of authors.)

2. **A. exarata** Trin. Culms erect, 3 to 12 dm. high, or often depauperate; panicle contracted and spike-like or loose and somewhat spreading, the branches densely flowered; lemma 2 mm. long, awnless, or rarely with a short prickle on the back.—Moist to rather dry open ground, throughout the state from the seacoast to middle altitudes in the mts.

22. PHLEUM L.

Annuals or perennials, with erect culms, flat blades, and dense spike-like panicles. Spikelets laterally compressed, disarticulating above the glumes. Glumes equal, membranous, keeled. Lemma shorter than the glumes, hyaline, broadly truncate, 3 to 5-nerved. Palea narrow, nearly as long as the lemma. (Greek phleos, a kind of reed.)

1. **P. pratense** L. TIMOTHY. Culms 6 to 12 dm. high, from a swollen or bulb-like base; panicles 3 to 15 cm. long.—Cult.; also escaped in fields and waste places; native of Eur.

23. STIPA L. PORCUPINE GRASS. SPEAR GRASS

Perennials, with usually convolute blades and narrow panicles. Spikelets disarticulating above the glumes, the articulation oblique, leaving a bearded, sharp-pointed callus attached to the base of the floret. Glumes membranous, often papery, acute or acuminate, usually long and narrow. Lemma narrow, terete, firm or indurate, strongly convolute, terminating in a bent and twisted prominent persistent awn. Palea inclosed in the

convolute lemma. (Greek stupa, tow, referring to the feathery awns of some species.)

Ligule evident; terminal segment of awn mostly 4 cm. or more long....1. *S. pulchra*.
Ligule minute; terminal segment of awn mostly less than 2 cm. long....2. *S. lepida*.

1. ***S. pulchra*** Hitchc. Culms 6 to 9 dm. high; blades long, narrow, flat or involute; ligule about 1 mm. long; panicle about 15 cm. long, loose, the branches spreading, slender, some of the lower 2.5 to 5 cm. long; glumes narrow, long-acuminate, purplish, the first about 2 cm. long, the second 2 to 4 mm. shorter; lemma 8 mm. long, sparingly pilose; awn 5 to 8 cm. long, short-pubescent to the second bend.—Open ground at low altitudes; common in the Coast Ranges; Sierra foothills; s. to San Diego Co.

2. ***S. lepida*** Hitchc. Culms slender, puberulent below the nodes, 6 to 9 dm. high; sheaths sparingly villous at throat; blades flat, narrow, 2 to 4 mm. wide, pubescent on upper surface near base; panicle rather loose, usually 15 to 20 cm. or sometimes more than 30 cm. long, the branches distant, slender; glumes acuminate, the first 6 to 10 mm. long, the second about 2 mm. shorter; lemma about 6 mm. long, sparingly villous, nearly glabrous toward the hairy-tufted apex; awn indistinctly twice bent, 2.5 to 4 cm. long, scabrous.—Open ground, Berkeley Hills to San Bernardino and San Diego. Var. **ANDERSONII** (Vasey) Hitchc. Differs chiefly in the slender involute blades; plant on the average smaller, with narrower few-flowered panicles, the spikelets usually smaller.—About same range but extending n. to Mt. Shasta.

24. **POLYPOGON** Desf.

Plants usually decumbent, with flat blades and dense bristly spike-like panicles. Pedicel disarticulating a short distance below the glumes, leaving a short-pointed callus; glumes equal, entire or 2-lobed, awned from the tip or from between the lobes, the awn slender, straight; lemma much shorter than the glumes, hyaline, usually bearing a slender straight awn shorter than the awns of the glumes. (Greek polus, much, and pogon, beard.)

Sheaths scabrous; panicles oblong, more or less interrupted or lobed....1. *P. lutosus*.
Sheaths smooth; panicles soft, dense, spike-like.....2. *P. monspeliensis*.

1. ***P. lutosus*** (Poir.) Hitchc. Culms geniculate at base, 3 to 7.5 dm. high; lemma smooth and shining, 1 mm. long, minutely toothed at the truncate apex, the awn about as long as the glumes.—Waste ground, throughout the state, especially along irrigation ditches; nat. from Eur.

2. ***P. monspeliensis*** (L.) Desf. **BEARD GRASS**. Culms erect or decumbent at base, scabrous below panicle, depauperate or as much as 9 dm. long; panicles tawny-yellow; floret turgid, the awn slightly exceeding the body of the glumes.—Waste places, common along irrigation ditches; nat. from Eur.

25. **CYNODON** Rich.

Usually low perennials with creeping stolons or rhizomes, short blades, and several slender spikes digitate at the summit of the upright flowering culms. Spikelets 1-flowered, sessile, the rachilla prolonged behind the palea, sometimes bearing a rudimentary lemma. Glumes narrow, acuminate, 1-nerved, about equal, shorter than the floret. Lemma strongly

compressed, pubescent on the keel, firm, 3-nerved, the lateral nerves close to the margins. (Greek *kuon*, a dog, and *odous*, tooth.)

1. **C. dactylon** (L.) Pers. BERMUDA GRASS. DEVIL GRASS. Culms flattened, wiry, glabrous; ligule a conspicuous ring of white hairs; spikes 4 to 6, 2.5 to 6 cm. long; spikelets imbricate, 2 mm. long.—Moist valley fields and along irrigating ditches; native of warmer parts of Old World. Under the name Bermuda Grass it is by some farmers regarded as good pasturage. Other farmers, watching its rapid invasion of their cultivated fields, liken it to a predatory corporation that sucks all their substance and, therefore, call it Devil Grass.

26. SPARTINA Schreb.

Stout erect tall perennials, with extensively creeping firm scaly rhizomes, long tough blades, and two to many appressed or sometimes spreading spikes racemose on the main axis. Spikelets 1-flowered, much flattened laterally, sessile and usually closely imbricate, disarticulating below the glumes, the rachilla not produced beyond the floret. Glumes keeled, 1-nerved, acute or short-awned, the first shorter, the second often exceeding the lemma. Lemma firm, keeled, the lateral nerves obscure, narrowed to a rather obtuse point. Palea keeled and flattened, the keel between or at one side of the nerves. (Greek *spartion*, a cord, referring to the tough leaves.)

1. **S. foliosa** Trin. Blades 8 to 12 mm. broad at the flat base, gradually narrowed to a long involute tip, smooth; inflorescence dense, spike-like; spikes numerous, close-appressed; glumes ciliate on keel; lemma hispidulous on sides, smooth on keel; palea longer than lemma.—Salt marshes and tidal flats along the coast, San Francisco Bay to San Diego. Useful in reclaiming marshland.

27. PHALARIS L.

Erect plants with flat blades and spike-like panicles. Spikelets laterally compressed, with 1 perfect floret and 2 reduced sterile lemmas, usually in dense spike-like panicles. Glumes equal, boat-shaped, often winged on the keel. Sterile lemmas reduced to 2 small scales (rarely only 1). Fertile lemma coriaceous, shorter than the glumes, inclosing the palea. (Ancient Greek name for some grass.)

Spikelets in groups of 7, 1 fertile surrounded by 6 sterile; keel of the glumes winged above, the wing extending into a tooth; glumes of the 4 outer sterile spikelets in lower part of panicle deformed into knobs; panicle dense, narrowed at base, often enclosed at base in the uppermost enlarged sheath.....1. *P. paradoxa*.

Spikelets single, all alike; glumes broadly winged on the keel above, more or less toothed; panicle ovate or short-oblong.....2. *P. minor*.

1. **P. paradoxa** L. GNAWED CANARY GRASS. Annual; culms tufted, more or less spreading at base, 3 to 6 dm. high; spikelets falling in groups of 7, the central fertile, nearly sessile, the others sterile, slender-pedicelled; fertile lemma smooth, shining, 3 mm. long, the sterile lemmas obsolete.—Grain fields, often abundant and widely distributed in the state; nat. from the Old World. Var. **PRAEMORSA** (Lam.) Coss. & Dur. Sterile spikelets short-pedicelled, the 4 outer much reduced, the apex deformed into knobs or variously incurved; fertile spikelet somewhat indurate, several-nerved at base, acuminate, the wing fin-like.—Waste places, San

Diego Co. to the Sacramento Valley, the commoner form; nat. from Eur.

2. **P. minor** Retz. Annual; culms erect, 3 to 9 dm. high; glumes with a green stripe on each side of the keel at the base of the wing, the wing scabrous on the margin and more or less toothed; fertile lemma ovate, acute, villous, about 3 mm. long, the sterile lemma solitary, about $\frac{1}{3}$ as long.—Waste places, rather abundant: Sacramento Valley to S. Cal.; nat. from Mediterranean region.

28. **ORYZA** L.

Ours a tall annual. Spikelets 1-flowered. Flowers perfect, in panicles. Glumes minute. Lemma and palea about equal, keeled, scabrous, the lemma more or less awned. Stamens 6. (From the Arabic name.)

1. **O. sativa** L. RICE. Cult. on low lands in the Sacramento Valley. It is an important cereal, furnishing food to more people of the earth than any other one grain. Native of Old World.

29. **PANICUM** L. PANIC GRASS

Annuals or perennials. Spikelets arranged in open or compact panicles, rarely racemes. Glumes usually very unequal, the first often minute, the second typically equaling the sterile lemma, the latter of the same texture and simulating a third glume, bearing in its axil a membranous or hyaline palea and sometimes a staminate flower, the palea rarely wanting. Fertile lemma chartaceous-indurate, typically obtuse, the nerves obsolete, the margins inrolled over an inclosed palea of the same texture. (Ancient Latin name for common millet.)

1. **P. pacificum** Hitchc. & Chase. Tufted perennial; vernal phase light green, more or less papillose-pilose throughout, 3 to 6 dm. high; ligule ciliate, about 4 mm. long; spikelets 1.8 to 2 mm. long; autumnal phase prostrate-spreading, repeatedly branching from the upper and middle nodes.—Sandy shores and slopes, and moist crevices in rocks: San Bernardino Mts. and Sierra Nevada, 500 to 4000 ft.; along the coast from Pt. Reyes to Del Norte Co.

30. **ECHINOCHLOA** Beauv.

Coarse, often succulent, our species annual with compressed sheaths, linear flat blades, and rather compact panicles of short densely flowered racemes along a main axis. Spikelets plano-convex, often stiffly hispid, solitary or in irregular clusters on one side of the panicle branches. First glume about half the length of the spikelet, pointed; second glume and sterile lemma equal, pointed, mucronate, or the glume short-awned and the lemma long-awned, sometimes conspicuously so, inclosing a membranous palea and sometimes a staminate flower. Fertile lemma plano-convex, smooth and shining, acuminate-pointed, the margins inrolled below, flat above, the apex of the palea not inclosed. (Greek echinos, hedgehog, and chloa, grass.)

1. **E. crusgalli** (L.) Beauv. WATER GRASS. Culms stout, 6 to 12 dm. high; leaves glabrous; panicle dense, 10 to 25 cm. long, consisting of several erect spreading or even drooping racemes; spikelets green or purple, long-awned or nearly awnless, about 3 mm. long, exclusive of awns, densely and irregularly crowded in 3 or 4 rows.—Fields and cult. soil, especially along irrigating ditches; serious pest in the Sacramento

Valley rice-fields; nat. from Eur. Var. *ZELAYENSIS* (H. B. K.) Hitchc. A pale short-awned form with short ascending racemes.—Open, often alkaline soil, mostly along irrigating ditches, Imperial Co.

31. *HOLCUS* L. *SORGHUM*

Annuals or perennials with flat blades and terminal panicles of 1 to 5 jointed tardily disarticulating racemes. Flowers perfect and staminate, borne in the same inflorescence but in unlike spikelets, the sessile spikelets with perfect flowers, the pedicellate with staminate flowers. Terminal joint with two pedicellate spikelets. (Old Latin name for a grass, probably from Greek *holcos*, attractive.)

Panicle large, open: spikelets very small; perennial by spreading rootstocks..... 1. *H. halepensis*.
Panicle smaller, denser; spikelets larger; annual..... 2. *H. sorghum*.

1. *H. halepensis* L. JOHNSON GRASS. Culms 6 to 12 dm. high; blades flat, 6 to 18 mm. wide, the midrib prominent, white; panicle 15 to 25 cm. long, open; fertile spikelets about 5 mm. long, the glumes pubescent, becoming glabrate and shining; fertile lemma with a bent readily deciduous awn; staminate spikelets narrow, 4 mm. long, on pedicels about 3 mm. long, the glumes membranous, nerved, glabrous.—Native of the Old World; cult. as a valuable forage grass but often becoming an aggressive weed. (*Andropogon halepensis* Brot.)

2. *H. sorghum* L. FIELD SORGHUM. Cult. from the Old World in many forms. Those with juicy pith include Sugar Sorghum and Kafir Corn. Those with dry pith include Broom Corn, Milo Maize and Durra (including Egyptian Corn). The sorghums are valuable fodder and grain plants, but when first introduced into the United States loud-sounding and extravagant claims were made by promoters for these cereals, whence the significant slang in American politics, Senator Sorghum. The Sudan Grass of cultivation is var. *SUDANENSIS* (Piper) Hitchc.; rootstocks none; branches few; midribs not white.

32. *ZEA* L. MAIZE

Annuals with broad leaves. Flowers unisexual, the staminate in a terminal panicle (the "tassel") the pistillate in a thick spike surrounded by leafy husks (the "ear"). Staminate spikelets in pairs on the rachis, one sessile, the other pediceled, each 2-flowered. Pistillate spikelets in several close rows upon a greatly thickened axis (the "cob"), consisting of one fertile and one sterile flower: styles numerous, protruding from the ear and forming the "silk". (An old Greek name for some common cereal.)

1. *Z. mays* L. INDIAN CORN. Native of America and cult. from prehistoric times. The wild ancestor is not known (cf. Collins, Jour. Wash. Acad. Sci. 2:520). Important cultural varieties are sweet, dent, and pop corn.

ORCHIDACEAE. ORCHID FAMILY

Perennial herbs. Flowers perfect, irregular, bracted, either solitary or in spikes or racemes. Sepals 3, alike. Petals 3, 2 alike, the third petal called the "lip" commonly dissimilar in color, size and shape, often enlarged, sac-like or spurred, in our genera most frequently brought

into an inferior position (i.e., on the lower side of the flower), by twisting of the ovary. Filaments united with the single style forming a column; anthers 1 or 2. Ovary inferior, commonly long and twisted, 1-celled. Fruit a 3-valved capsule. Seeds innumerable, minute.—The largest family of seed plants, consisting of about 13,000 species, of wide distribution but most abundant in the tropics. Many are highly ornamental, though few are of economic value.

Leaves foliaceous, i.e., the plants with green herbage.

Flowers solitary or several, showy; lip large and sac-like.

Leaves 2 to many, cauline; sepals and petals brown or greenish-yellow....

1. *CYPRIPEDIUM*.

Leaf 1, basal; sepals and petals rose-purple.....2. *CALYPSO*.

Flowers many, spicate or racemose; lip various, but not saccate.

Perianth with a spur; bracts inconspicuous.....3. *HABENARIA*.

Perianth spurless; bracts conspicuous, foliaceous.....4. *EPIPACTIS*.

Leaves reduced and scale-like, the plants destitute of green herbage.....

5. *CORALLORRHIZA*.

1. *CYPRIPEDIUM* L. LADY'S SLIPPER

Stems leafy, rough-pubescent, from tufted fibrous roots. Leaves 2 to many, large. Flowers few or solitary, large and showy, leafy-bracted. Sepals spreading, in ours seeming as if only 2, the lateral completely or almost completely united into one under the lip or inflated sac. (Greek Cypris, Venus, and pedilon, shoe, the saccate lip a fit buskin for the goddess.)

Stem with several alternate leaves, 2.8 to 5.7 dm. high.

Petals linear-lanceolate 3 to 4.8 cm. long; lower sepals united almost to the apex, the subulate tips free.....1. *C. montanum*.

Petals oblong-linear, 1.2 to 1.4 cm. long; lower sepals united quite to the apex.....2. *C. californicum*.

Stem with 2 opposite leaves, 4.8 to 24 cm. high; sepals and petals lanceolate, 1.2 to 2.4 cm. long.....3. *C. fasciculatum*.

1. *C. montanum* Dougl. Leaves elliptic- to narrowly-ovate, the largest 1.2 to 1.4 dm. long; flowers 1 to 3; sepals and wavy-twisted petals usually dark brown, linear-lanceolate, 3.6 to 6 cm. long; lip 2.4 cm. long, dull white, veined with purple; capsule erect or nearly so.—Dense woods, Coast Ranges and Sierra Nevada.

2. *C. californicum* Gray. Leaves ovate-lanceolate (or ovate), acute or acuminate, 7.2 to 14.4 cm. long, the upper lanceolate; flowers 1 to 6, greenish-yellow; lip obovoid, white or light rose-color, veined with purple, 1.6 to 2 cm. long; capsule reflexed.—Marin Co.; Del Norte Co. to Lassen Co.

3. *C. fasciculatum* Kell. Leaves 2, nearly opposite, ovate to nearly orbicular, 4.8 to 9.6 cm. long, pale green, with 3 prominent ribs beneath; flowers solitary or 2 to several in a small terminal cluster; lip depressed-ovate, greenish-yellow with brown or purplish margin, 8 to 12 mm. long.—Dry open hillsides: Santa Cruz Co.; Plumas Co. to Del Norte Co.

2. *CALYPSO* Salisb.

Low herb with a corm and coral-like roots. Stem scape-like, sheathed by a few scale-like leaves, with a single drooping terminal flower. Flowers large, showy. Sepals and petals similar, equal, distinct; lip sac-like, terminating in 2 short spurs protruding from beneath a winged

margin; upper side of sac inside with 3 densely ciliate ridges running from the opening towards the spurs, with 2 short spurs below the expanded apex. (The nymph Calypso in Homer.)

1. **C. bulbosa** (L.) Oakes. CALYPSO. Stem 9.6 to 12 cm. high; leaf ovate, cordate or truncate at base; sepals and petals rose-purple, sometimes pale; lip as long or slightly longer, ovate-inflated, reddish-brown and mottled.—Bogs or in leaf-mold in redwood or pine forests from Marin Co. northw.

3. HABENARIA Willd. REIN-ORCHIS

Stems erect, leafy at least at base, solitary from fleshy tuber-like roots. Flowers greenish, yellowish, or white, in a terminal spike or raceme. Sepals equal, the lateral mostly spreading, the petals a trifle smaller. Lip spreading or drooping, in ours entire, produced at base into a long slender spur. (Latin habena, a thong or rein of a horse, on account of the shape of the spur in some species.)

1. **H. elegans** (Lindl.) Jepson. Stem slender, strict, 2.4 to 3 dm. high; basal leaves oblanceolate to lanceolate; spike slender, laxly flowered, attenuate at apex, 1.2 to 1.6 dm. long; flowers whitish; spur as long as or a little longer than the ovary.—S. Cal. and Coast Range woods mostly near the coast.

2. **H. maritima** Greene. Low and stout, 1.4 to 3 dm. high; basal leaves oblong, acute; spike very dense and thick, slightly conical, 3.6 to 9.6 cm. long; flowers white, with a heavy fragrance; spur slender, longer than the ovary.—Sea-cliffs or coast hills, San Francisco Co. to Humboldt Co.

4. EPIPACTIS Haller

Stem leafy from a creeping rootstock. Flowers in a raceme with foliaceous bracts. Sepals and petals nearly equal, spreading; lip strongly constricted at the middle, the lower portion deeply concave, the upper portion dilated. Ovaries reflexed at maturity. (Greek epipegnoo, because used to curdle milk.)

1. **E. gigantea** Dougl. STREAM ORCHIS. Stout, 2.8 to 8.6 (or 11.5) dm. high, nearly glabrous; leaves ovate below, lanceolate above, acute or acuminate, 7.2 to 16.8 cm. long; raceme minutely pubescent; flowers 3 to 10; sepals greenish; petals rose-color, purple-veined, particularly the lip.—Moist stream banks.

5. CORALLORRHIZA R. Br. CORAL-ROOT

Brownish or yellowish saprophytes or root-parasites, destitute of green herbage, and with branching toothed coral-like roots. Stems scape-like, the flowers in a terminal raceme. Perianth-segments oblong or lanceolate, nearly alike, ours 3-nerved, gibbous at base over the ovary, or the lateral sepals united at base with the foot of the column, forming a short spur. Capsules reflexed. (Greek korallion, coral, and rhiza, root.)

1. **C. striata** Lindl. Stems many in a cluster, 1.9 to 4.8 dm. high; sepals and petals somewhat flesh-colored, striately 3-nerved with purple or reddish-brown lines, about 1.2 cm. long, approximated on upper side of flower and curved over column in such a way as to form a sort of hood; spur none.—Woods, 500 to 5000 ft. **C. MACULATA** Raf. Spur present, attached to ovary.—Mt. woods, 3000 to 6000 ft.



Deer Brush (*Ceanothus integerrimus* H. & A.). *a*, panicle; *b*, capsule. This species is an important browse shrub in the Sierras. See p. 77.

GLOSSARY

- Achene*, a dry indehiscent 1-seeded fruit.
- Acuminate*, tapering gradually to the apex.
- Acute*, with a sharp point.
- Adherent* or *adnate*, growing fast to or united with another organ or body.
- Anterior*, the side in front; in an axillary flower the side away from the axis.
- Anthesis*, the period during which a flower is expanded, the anthers shedding pollen and the stigmas receptive.
- Appendage*, any supplementary or superadded part.
- Axil*, the angle between a leaf and stem.
- Axile*, referring to the axis.
- Axillary*, borne in the axil.
- Berry*, a fleshy indehiscent fruit.
- Bifid*, 2-cleft.
- Bract*, the modified leaf of a flower-cluster.
- Bractlet*, the small modified leaf subtending a single flower or borne on the pedicel.
- Caducous*, dropping off very early as compared with other parts.
- Capitate*, gathered or collected into a head-like cluster.
- Capsule*, a dry seed-vessel which splits open and is composed of more than one carpel.
- Carpel*, a simple pistil with a 1-celled ovary, 1 placenta, 1 style and 1 stigma, or one of the units of a compound pistil; also applied to a simple pistil when mature or to one of the parts of a compound pistil which splits up when ripe.
- Caudex*, a short woody stem at the surface of the ground, rarely rising conspicuously above the surface.
- Chamisal*, collective term, including the individuals of *Adenostoma*, a gregarious shrub.
- Chaparral*, collective term referring to the low shrubs which form extensive colonies on mountain slopes, including particularly the Manzanita, Buck Brush, Scrub Oak, *Pickeringia* and similar species with rigid or thorny branches.
- Choripetalous* or *chorisepalous*, with distinct petals or sepals.
- Ciliate*, having the margin bordered with a row of hairs.
- Circumscissile*, with pod dehiscing around the middle, the top coming off like a lid.
- Cismontane*, this side of the mountains; cismontane S. Cal., coastal Southern California.
- Claw*, the narrow stalk-like base of a petal, as in the Pinks.
- Cleft*, with sharp lobes.
- Connivent*, lightly joined.
- Convolute*, rolled inwards from one side to the other.
- Corymb*, a flat-topped flower cluster, the pedicels of unequal length.
- Crenate*, with rounded or blunt teeth.
- Deciduous*, falling when ripe or after the function has been performed.
- Decumbent*, lying on the ground but tending to rise at the end.
- Deltoid*, triangular in outline.
- Dentate*, toothed, with the teeth standing directly outwards.
- Denticulate*, dentate with fine teeth.
- Diadelphous*, united in two sets.
- Dichotomous*, branching or forking, with the two divisions nearly equal.

- Discrete*, not crowded, distinctly separate but not remote or distant.
- Dissected*, several times cut into small segments.
- Divided*, cleft quite to the base or to the midrib.
- Emarginate*, with a sharp notch.
- Entire*, the margin not toothed or indented.
- Epigynous*, as if borne on the summit of the ovary.
- Exserted*, protruding beyond the surrounding organ.
- Fascicle*, a close cluster or bundle.
- Fertile*, setting fruit or containing good pollen.
- Fistulous*, hollow.
- Foliaceous*, leaf-like.
- Follicle*, the fruit of a simple pistil.
- Free*, not united to another organ.
- Gibbous*, swollen or distended on one side.
- Glabrous*, not hairy; bald.
- Herb*, a plant without woody stem or parts, at least above ground.
- Hispid*, with stiff rigid hairs.
- Hispidulous*, minutely hispid.
- Hooded*, concave or curved in at the top like a hood.
- Hypogynous*, inserted on the receptacle and free from the ovary.
- Incised*, cut irregularly.
- Included*, not protruding beyond the surrounding organ.
- Indehiscent*, not splitting open.
- Inferior ovary*, one more or less attached to the calyx.
- Involucre*, a circle of bracts subtending a flower-cluster; *involucel*, a secondary involucre.
- Laciniate*, cut or slashed into narrow divisions.
- Leaflet*, one of the divisions of a compound leaf.
- Limb*, the spreading part of a corolla.
- Lobe*, a shallow division of an organ.
- Monadelphous*, united in one set.
- Nut*, an indehiscent fruit with a hard firm wall; *nutlet*, a diminutive nut.
- Obtuse*, blunt or rounded.
- Palmate*, with the parts borne like the fingers on a hand.
- Panicle*, a compound flower-cluster, a raceme or corymb compounded by branching.
- Pappus*, the modified calyx of Compositae, often hair-like, bristly or scaly.
- Parted*, cleft nearly but not quite to the base or to the midrib.
- Pedicel*, stalk of a flower in a flower-cluster.
- Peduncle*, stalk of a flower or flower-cluster.
- Perigynous*, inserted on the calyx.
- Persistent*, falling away tardily or not at all.
- Pinnate*, with the leaflets arranged along each side of a common petiole.
- Pinnatifid*, cleft in a pinnate manner.
- Pistil*, is simple when composed of a single carpel, is compound when composed of 2 or more carpels.
- Placenta*, the portion of the ovary wall bearing the ovules.
- Pod*, a dry dehiscent fruit, such as a capsule, follicle, legume or silique.
- Posterior*, the side behind, in an axillary flower the side next to the axis.
- Prostrate*, lying close along the ground.
- Puberulent*, minutely pubescent.
- Pubescent*, clothed with hairs.
- Raceme*, a flower-cluster in which the flowers are borne along the peduncle on pedicels of nearly equal length.
- Revolute*, rolled backward from each side.

Rotate, wheel-shaped.

Rudiment, an imperfectly developed organ.

Scape, a leafless flowering stem arising from the ground.

Serrate, toothed or with a saw-like edge.

Smooth, not rough.

Spike, a flower-cluster in which the flowers are sessile along the peduncle.

Sterile, barren, not fertile.

Stipule, an appendage at base of a leaf; *stipel*, one at base of a leaflet.

Strict, closely upright, not spreading.

Succulent, juicy or fleshy.

Superior ovary, one free from the calyx.

Sympetalous or *synsepalous*, with more or less united petals or sepals.

Throat, the upper expanded portion or orifice of a corolla-tube.

Turbinate, top-shaped.

Two-lipped, cleft into 2 lips, an upper and a lower, as the corolla of *Mimulus* or of *Sage*.

Umbel, a flat-topped flower-cluster, the pedicels proceeding from the summit of the peduncle and nearly equal.

Verticil, same as whorl.

Whorl, borne on an axis in a circle.



California Wild Grape (*Vitis californica* Bth.). *a*, leaf and fruit cluster; *b*, flower, with the calyx lifting; *c*, flower in anthesis. These grapes make one of the most finely flavored jellies that ever gratified the palate of mortal man.

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Coffee Berry (*Rhamnus californica* Esch.). The bark is used as a substitute for Cascara Sagrada; as a laxative drug it has essentially the same principles.

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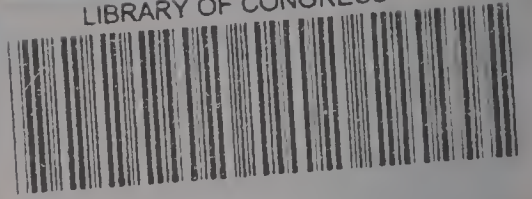
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